OCTOBER
1951

Chemical Engineering

DISASTER CONTROL: IS YOUR PLANT SET UP TO COPE WITH DISASTERS? **PAGE 149**

A McGRAW-HILL PUBLICATION

FIFTY CENTS

Remember the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS, INC.

the engineered way to put an end to a pressure problem

WHEN IT COMES to containing pressures—in a header or pressure vessel or in merely blanking off a line—your safest, surest bet is a TUBE-TURN Welding Cap. Formed to 2:1 semi-ellipsoidal contours, it represents the ideal pressure-resisting closure for a cylinder. No makeshift capping method can approach its bursting strength which is actually far greater than seamless tubing of like thickness and grade of steel.

Another important point: TUBE-TURN Welding Caps are manufactured to meet ASME Boiler Code requirements and the chemical-physical standards of ASTM specification A106 for Grade A and Grade B carbon steels.

For welding caps and for all TUBE-TURN Welding Fittings and Flanges, see your nearby TUBE TURNS' Distributor. You'll find one in every principal city.

Write Dept. H-10 for free booklet giving Dimensional Data on types, sizes and materials of TUBE-TURN Welding Fittings and Flanges.

"Be sure you see the double tt*"*

TUBE TURNS, INC. LOUISVILLE 1, KENTUCKY

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Houston • Tulsa • San Francisco • Los Angeles
TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO ... A wholly owned subsidiary of TUBE TURNS, INC.

OCTOBER
1951

Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

PUBLISHER.....Wallace F. Traendly
EDITORIAL DIRECTOR....Sidney D. Kirkpatrick

EDITOR.....John R. Callaham
MANAGING EDITOR.....Lester B. Pope
SENIOR ASSOCIATE EDITOR...T. R. Olive
ASSOCIATE EDITOR.....Cecil H. Chilton
ASSISTANT EDITOR...Morgan M. Hoover

ASSISTANT EDITOR...Richard V. Reeves
NEWS EDITOR.....Joseph A. O'Connor
EDITORIAL ASSISTANT.....Frances Arne
EDITORIAL ASSISTANT...A. J. O'Brien, Jr.
ART EDITOR.....Margaret Redfield

SOUTHWEST EDITOR.....James A. Lee
WEST COAST EDITOR.....Elliott Schrier
MIDWEST EDITOR.....Frank C. Byrnes
WASHINGTON EDITORS....R. S. McBride
G. S. Bryant, Jr., John Kent

ENGINEERING AND EQUIPMENT

Cuts Paint Evaluation Time.....Kenneth Tator 140
Converting to z-Compressibility.....Kenneth A. Kobe 143
Turnover Ratios Analyzed.....Gordon Kiddoo 145
New Approach to Payout Calculations.....John Happel 146
Disaster Control—Plant Defense, Part I.....John F. Elich 149
Nomograph For Boiling Point Rise.....Richard Jarzombek and John E. Meyers 156
Agglomeration.....Feature Report 161
Materials of Construction vs. Hydrogen Peroxide.....Corrosion Forum 263
Latest Filtration Theory and Practice.....303
Plant Notebook.....158 Process Equipment News.....176
Equipment Cost Index.....176

PROCESSES AND PRODUCTS

Titanium.....Joseph A. O'Connor 136
Neoprene Widens Its Field.....196
Anhydrous HCl.....Pictured Flowsheet 208
Phenol From Cumene.....215
Future of Pyridine?.....Charles H. Carpenter, Jr. 344
New Products and Materials.....196

NEWS AND TRENDS

Wanted: More Recruits For Professional Services.....Editorial Foreword 135
Will Industry Shift Its Plants?.....Chemical Economics 339
Chementator.....103 Convention Calendar.....227
Editorial Viewpoints.....154 News From Abroad.....255
Chemical Engineering News.....215 Process Industry Trends.....342
New Construction.....350

PEOPLE AND FIRMS

Your One Page Reports Can Really Say Something.....275
Memo From the Editor.....133 Names in the News.....283
Readers' Views and Comments.....246 Mark E. Putnam.....283
You and Your Job.....275 Industrial Notes.....296

LITERATURE AIDS

New Technical Literature.....204 Chemical Engineer's Bookshelf.....323
Quotes, Extracts and Digests.....303 Recent Books and Pamphlets.....332
Reader Service Section.....Inside Back Cover

October 1951 CHEMICAL ENGINEERING Vol. 58—No. 10
Member ABC and ABP

Published monthly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder. **Publication Office 99-129 North Broadway, Albany 1, N. Y.**

Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 West 42nd St., New York 18, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice President and Director of Advertising; J. E. Blackburn, Jr., Vice President and Director of Circulation.

Subscriptions: Address correspondence to Chemical Engineering—Subscription Service, 99-129 North Broadway, Albany 1, N. Y. or 330 West 42nd St., New York 18, N. Y. Allow ten days for change of address.

Please indicate position and company connection on all subscription orders. Chemical Engineering solicits subscriptions only from executives and engineers in companies in which chemical engineering and processing form an important part of the total operation, and from consultants and laboratories whose field includes such process industries.

Single copies 50 cents. Subscription rates—United States and possessions, $2 per year, $4 for two years, $5 for three years; Canada, $4 per year, $6 for two years, $8 for three years; Pan American countries, $15 per year, $28 for two years, $39 for three years; all other countries, single copies $2 each, $20 per year, $30 for two years, $40 for three years. Entered as second-class matter Sept. 3, 1936, at Post Office at Albany, N. Y., under act of March 3, 1879. Printed in U. S. A. Copyright 1951 by McGraw-Hill Publishing Co., Inc. All Rights Reserved.

ACID-RESISTANT SWENSON EQUIPMENT

Titanium is obtained commercially from Ilmenite ore, which is ground and treated with sulfuric acid. The resultant solution contains titanium sulfate and ferrous sulfate.

The solution is concentrated with Swenson Evaporators, and the ferrous sulfate crystallized out in the form of copperas in Swenson Vacuum Crystallizers. The copperas crystals are separated from the liquor with Swenson R.D.V. Filters.

Swenson engineers have developed acid-resistant equipment for this and many other processes which require the handling of corrosive liquors. They have invaluable experience in 1) recovering chemical values from natural brines and minerals; 2) simplifying chemical processes and procedures; 3) effecting economies in the use of heat, power, labor, and materials; and 4) disposing of chemical wastes and recovering inherent values.

IT WILL PAY YOU TO CONSULT THEM

ONLY SWENSON PROVIDES THIS SERVICE

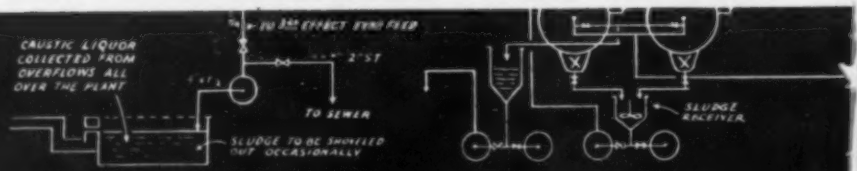
SWENSON EVAPORATOR CO.

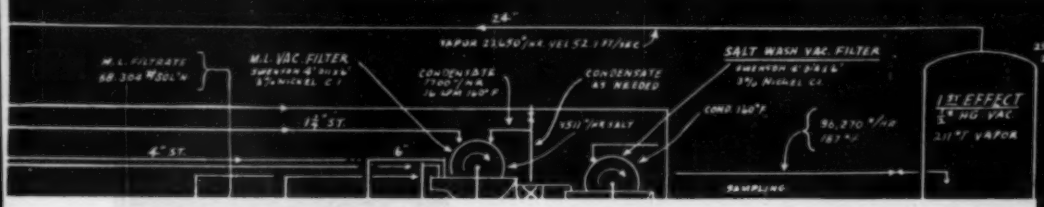
Division of Whiting Corporation

15669 Lathrop Avenue — Harvey, Illinois

Export Department: 30 Church St., New York 7, N. Y.

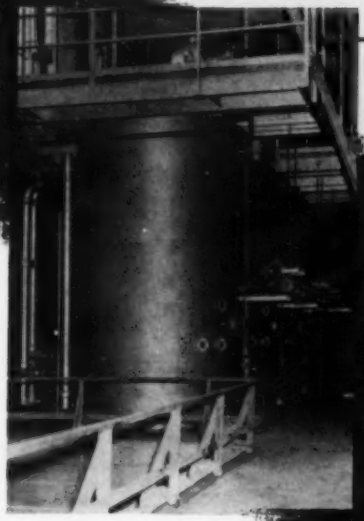
In Canada: Whiting Corporation (Canada) Ltd., 47-49 LaPlante Ave., Toronto 2


CAUSTIC LIQUOR COLLECTED FROM OVERFLOWS ALL OVER THE PLANT
TO SEWER
SLUDGE TO BE SHOVELED OUT OCCASIONALLY
SLUDGE RECEIVER

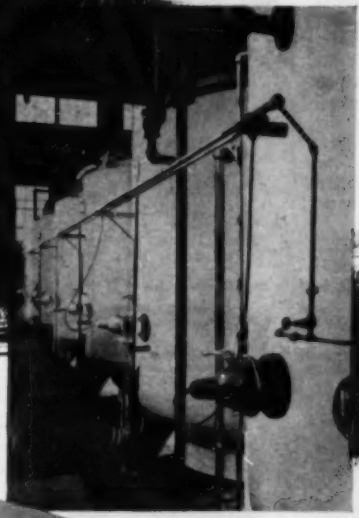


SWENSON R.D.V. FILTER with lead drum. Equipment of this type is used to filter acid slurries.

THE PRODUCTION OF TITANIUM



SWENSON CRYSTALLIZERS with rubber-lined steel construction, used for precipitating salts from acid solutions.



SWENSON EVAPORATORS with rubber lining and carbon tubes, used for concentrating acid solutions.

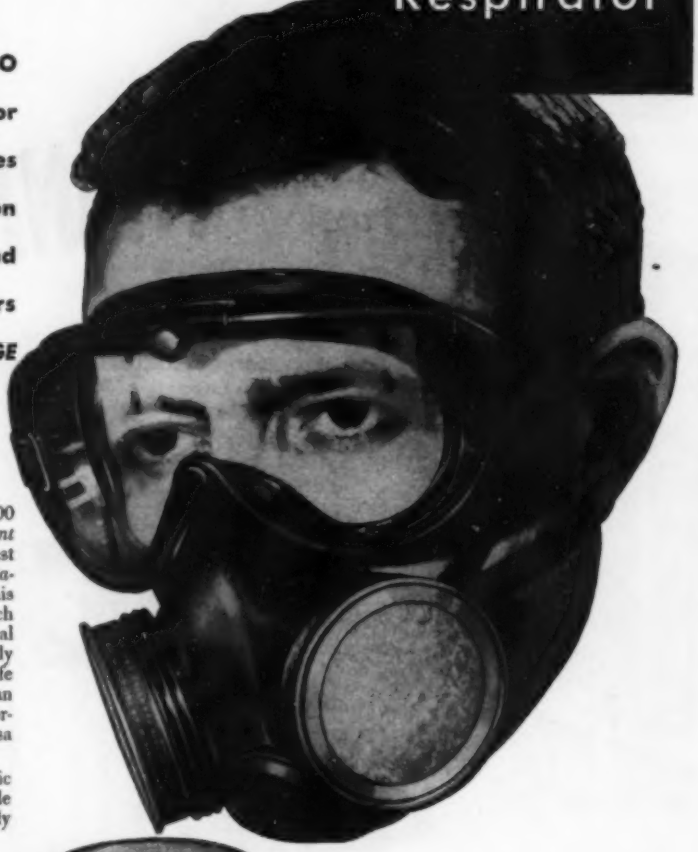
SWENSON
REG. U.S. PAT. OFF.
EVAPORATORS • FILTERS • CRYSTALLIZERS
SPRAY DRYERS

SWENSON EVAPORATOR CO HARVEY, ILL., U.S.A.	
Req.	Title - FLOW SHEET 4 MATERIAL BALANCE
Chd FM	Capacity
Scale 1/2" = ONE FT	For
Appr	D-2265
Appr.	

Another AO "First" in Protection!

AO R5055 Respirator

Only the AO Twin Cartridge Respirator has Bureau of Mines Approval for protection against all dusts and organic vapors *IN ONE CARTRIDGE*



Yes, the AO R5055 Respirator (R5000 line) leads the way to a new, *convenient* standard of safety by protecting against organic vapors and all dusts *simultaneously*. The "business end" of this protection is the R55 cartridge which contains *both* a highly efficient chemical absorbent and a cover of chemically treated felt. Result: wearers are safe when both hazards are present and can move freely from dust to organic vapor-contaminated atmospheres or vice versa without changing cartridges.

The R5055 Respirator with its basic R5000 Face Piece and interchangeable cartridges and disc filter can be quickly converted to protect against

(1) A combination of all dusts
(2) Light organic fumes, vapors and gases
(3) Acid gases, fumes and mists
(4) Combined acid and organic gases
(5) Low concentrations of ammonia
(6) Metal fumes as in welding, burning, smelting, refining

Your nearest AO Safety Products Representative can supply you with this "7-in-1" respirator that gives *double* the protection.

QUICK FACTS

- New threaded chemical cartridges
- Famous AO disc type filters
- Increased visual area
- New face piece
- New flexible fitting brace
- New port and valve design
- Double headband

American Optical
SAFETY PRODUCTS DIVISION

Southbridge, Massachusetts • Branches in Principal Cities

It's new... so it's MARLEY!

U. S. PATENTS 2330901 AND 2342952

patented MORTISLOCKED nail-less filling

. . . THE COOLING TOWER FILLING THAT BREATHES

. . . has long been an important factor in making Marley Double-Flow the world's leading water cooling tower. Now it's redesigned for even greater ruggedness, more long-lasting stability.

And it retains its ability to expand and contract with every variation of temperature and moisture.

Design simplicity is the keynote of MortisLocked filling . . . no nails, bolts or spacer blocks are needed. There are no parts to rust, corrode or fall out. Bulletin ML-51 graphically portrays MortisLocked superiority . . . write for it now.

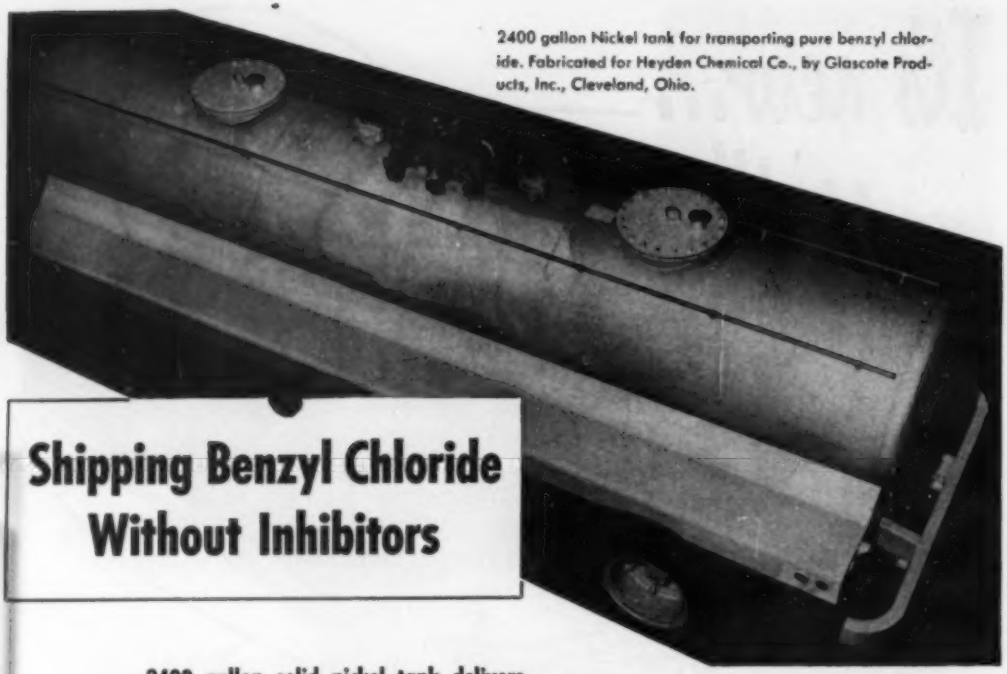
5113

producers of
DOUBLE FLOW TOWERS
DRICOOLERS
AQUATOWERS
NATURAL DRAFT TOWERS
CONVENTIONAL TOWERS
SPRAY NOZZLES
VAIRFLO TOWERS

MARLEY

The Marley Company, Inc.

KANSAS CITY 15, KANSAS



2400 gallon Nickel tank for transporting pure benzyl chloride. Fabricated for Heyden Chemical Co., by Glascote Products, Inc., Cleveland, Ohio.

Shipping Benzyl Chloride Without Inhibitors

2400 gallon solid nickel tank delivers chemicals "water white"

Heyden Chemical Corp., Fords, N. J., wanted to eliminate the extra step of reprocessing benzyl chloride after shipping.

They wanted a container that would protect the original purity of the chemical *and* they wanted it large enough to permit large bulk shipments between their plants.

The Cleveland, Ohio firm of Glascote Products, Inc., gave them the answer to their problem.

Glascote fabricated a solid Nickel tank trailer with two compartments—each with a capacity of 1200 gallons. The tanks, of welded construction, were also equipped with Nickel fittings so that no contamination could take place during filling and emptying.

The tank trailer has now been in operation over a year and a half. And Heyden is now able to make satisfactorily large shipments of pure benzyl chloride. At the same time they have eliminated the time and expense of reprocessing.

Like Heyden, many a chemical manufacturer and processor is relying on Nickel for purity protection in storage and transportation. And because of its high resistance to many corrosive media, Nickel requires only a minimum of maintenance. This assures long-range economies far outweighing original installation costs.

Right now Nickel and Inco Nickel alloys are being diverted to defense. Therefore, you may not be able to get all you want. But if you have a special metal problem, whether it be for purity or another reason, Inco's Technical Service and Corrosion Engineering Sections are always ready to help you. Write today, outlining in detail.

EMBLEM OF SERVICE INCO TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC.

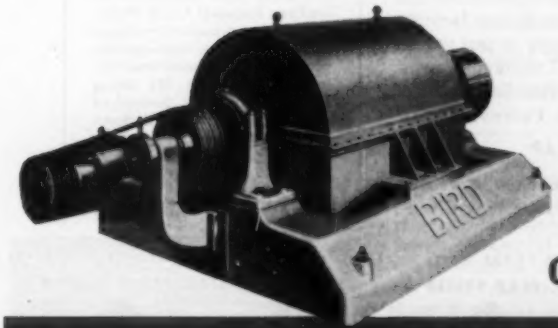
67 Wall Street, New York 5, N. Y.

For The Electrolytic Caustic Industry Alone

BIRDS FILTER AND WASH BETTER THAN 5,000 TONS OF SALT PER DAY!

Thorough and efficient washing as well as deliquoring is of particular importance on caustic salt. Bird Continuous Centrifugul Filters meet the widely varying and exacting wash specifications of this industry in a way that is unexcelled by any other filtering equipment.

Bird Filters are preferred throughout the industry not only on account of these performance advantages but because of their simplicity of design and construction, lasting dependability and low operating cost as well as low initial cost.



The BIRD CONTINUOUS CENTRIFUGAL FILTER

BIRD MACHINE COMPANY

SOUTH WALPOLE • MASSACHUSETTS

Fabricated by an equipment builder using the Lukenomics principle.

Production Idea

from results with rosin

Heat . . . Pressure . . . Corrosion. These three problems are increasingly acute as metal supplies get tighter; new equipment harder to buy, and reconditioning more difficult. But in practically every case, alert equipment builders can find a highly satisfactory answer. This case history, involving rosin production with clad steel equipment, is typical.

Finding the correct solution to tough equipment problems is *the* job of progressive equipment builders. You'll find many of the best of them applying the *Lukenomics* principle. For Lukenomics combines their experience and that of designers and engineers with Lukens' specialized knowledge of materials and their application. Such cooperative ingenuity always benefits the ultimate user of equipment. We'll be happy to put you in touch with equipment builders applying the Lukenomics principle. Just write—Manager of Marketing Service, Lukens Steel Company, 400 Lukens Building, Coatesville, Pennsylvania.

SPEED SALE OF YOUR SCRAP

Visit the Luken's booth (558-563) at the Chemical Show, November 26-December 1, 1951. Grand Central Palace, New York City.

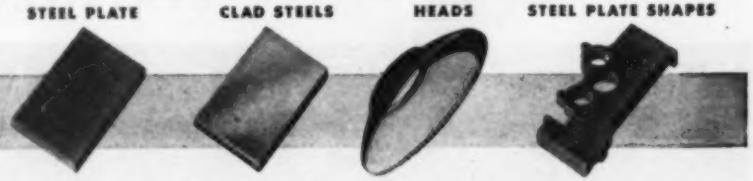
Used in the production of white "premium" rosin, this equipment must prevent product discoloration; withstand alternate heating and cooling; high pressure and vacuum. To prevent corrosion, resist thermal shock and provide structural strength economically, the units were fabricated of Lukens Inconel-Clad Steel. Result: economical volume production of a high-quality product, reduced maintenance, increased profits. By using Inconel-Clad Steel, instead of solid Inconel, the equipment builder effected a 71% saving of this critical nickel alloy. *This is Lukenomics at work.*

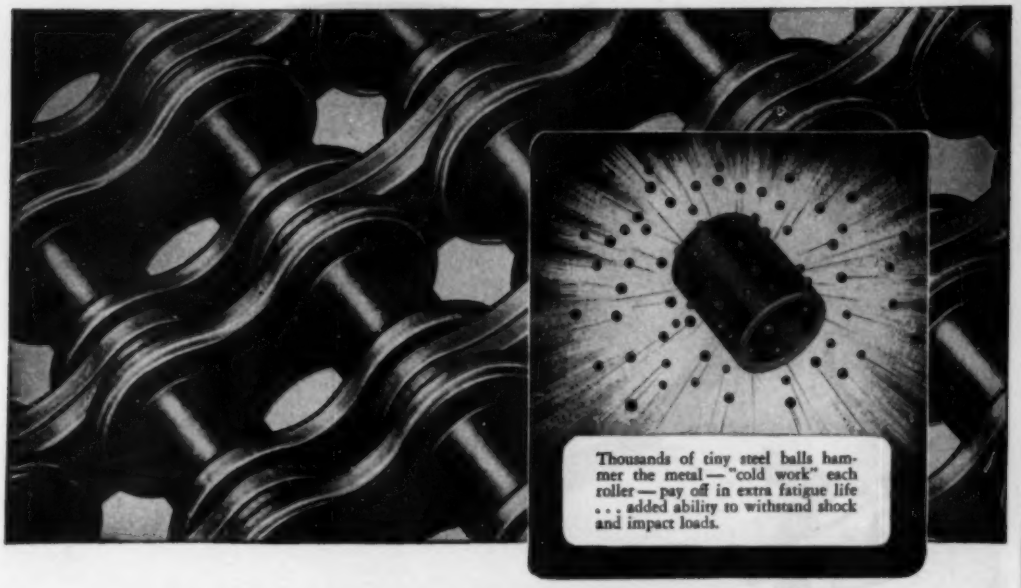
LUKENS

LUKENS STEEL COMPANY

OVER 140 YEARS' EXPERIENCE AS THE WORLD'S LEADING PRODUCER OF SPECIALTY STEEL PRODUCTS

STEEL PLATE | CLAD STEELS | HEADS | STEEL PLATE SHAPES




Thousands of tiny steel balls hammer the metal — "cold work" each roller — pay off in extra fatigue life . . . added ability to withstand shock and impact loads.

Why you should be sure the roller chain you buy has

SHOT-PEENED ROLLERS

. . . one of the extra-strength features you get with every LINK-BELT Roller Chain

LOOK for the distinguishing darkened rollers on every roller chain you buy! They're your guarantee of extra fatigue life.

Shot-peening is just one of the added manufacturing refinements that make Link-Belt Precision Steel Roller Chain a longer-life chain. Controlled material selection and heat treating assure absolute uniformity . . . no weak members.

Link-Belt Roller Chain is available in single or multiple widths, in ⅜ to 3 in. single and double pitch. For the best in roller chain, get in touch with your nearest Link-Belt office.

Easier coupling and uncoupling without sacrificing load distribution

Patented E-Z Assembly feature of Link-Belt Precision Steel Roller Chain has won world-wide approval. Coupling and uncoupling of multiple width chains—right on the job—is far easier. There's absolutely no sacrifice of load distribution . . . no loss of the chain's remarkable performance. Press-fits between chain pins and middle bars have been modified. But full load-carrying capacity across the entire width of the chain has been maintained.

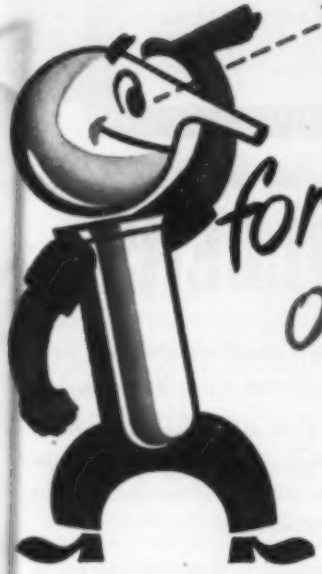
LINK-BELT

PRECISION STEEL ROLLER CHAIN

LINK-BELT COMPANY: Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in principal cities. 12.288

Look to ENJAY

*Trade-Mark



for an extensive line of oxygenated solvents and chemicals

The famous ENJAY* Oval Trade-mark stands for a diverse line of high-quality chemicals and solvents. An increasing number of industries are using dependable Enjay chemicals to increase product quality.

EXPERIENCED

RELIABLE

DIVERSIFIED

ENJAY markets this wide range of industrial chemicals:

Petrohol 91 (Isopropyl Alcohol)
Petrohol 95 (Isopropyl Alcohol)
Petrohol 99 (Isopropyl Alcohol)
Secondary Butyl Alcohol
Isooctyl Alcohol
Isopropyl Acetate
Secondary Butyl Acetate
Acetone

Methyl Ethyl Ketone
Ethyl Ether
Isopropyl Ether
Diisobutylene
Polypropylenes
Butadiene
Isoprene
Dicyclopentadiene

Aromatic Tars
Paratone
Parapoid
Paratac
Paranox
Paraflow
Vistanex
Naphthenic Acids

Enjay products are marketed in drum and tank car quantities

ENJAY COMPANY, INC.
15 W. 51st St., New York 19, N. Y.

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

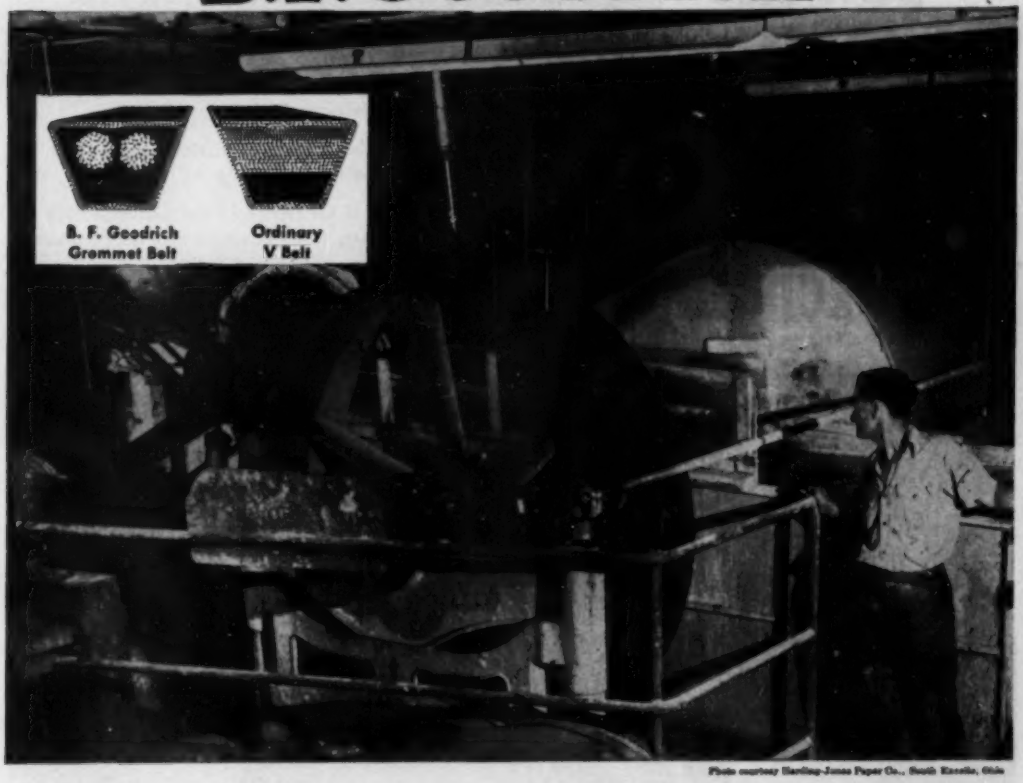


Photo courtesy Harding-Jones Paper Co., South Kenova, Ohio

Drive headache cured with B. F. Goodrich grommet belts

B. F. Goodrich grommet V belts cut costs 20 to 50%

HERE was one of the biggest drive problems in this plant. The machine shown in the picture runs 24 hours a day, 7 days a week. Belts previously used couldn't handle the job. Motor bearings were burning out, belts were snapping under the shock load.

Then a B. F. Goodrich distributor suggested grommet belts to stand the jerks and hard pulls. Installed nine months ago, B. F. Goodrich grommet belts are still going strong, and look good for many more months of use. Here's why BFG grommet belts give longer service, save maintenance costs:

Endless — A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping cord sections. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless grommet belt eliminates such failures.

Concentrated cord strength — All of the cord material in a B. F. Goodrich grommet belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. No layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced.

Better grip, less slip — Because a grommet is endless, a grommet belt is more flexible, grips the pulleys better. Size for size, grommet belts will give ⅓ more gripping power, pull heavier loads with a higher safety factor.

Only B. F. Goodrich makes the grommet! — No other multiple-V belt is a grommet belt (U. S. Patent No. 2,233,294). Now available in C, D and F sections. See your local B.F.Goodrich distributor. Ask him to show you his "X-ray" belt that illustrates grommet construction clearly. *The B.F.Goodrich Company, Industrial & General Products Division, Akron, Ohio.*

Grommet Belts BY

B.F.Goodrich

RUBBER FOR INDUSTRY

puts the HEAT on heat exchangers

By changing to Yarway Impulse Steam Traps, an oil refinery reports much hotter steam in their heat exchangers **—plus two other important extras:**

(1) They were able to operate the plant with 6 boilers instead of the 8 formerly required.

(2) Three men formerly required to service old-type traps can now be used for productive work.

Significant sidelight—these Yarway traps are operating under severe conditions, many outdoors with temperatures often below zero.

Plant after plant is standardizing on Yarway Impulse Steam Traps because Yarways are designed to deliver the most premium B.T.U.'s at top temperatures into your process or product. **They get equipment hotter, sooner . . . and keep it hot.**

Other reasons—small size, easy installation, good for all pressures, only one moving part, low maintenance, low price.

Buy your Yarway Impulse Steam Traps from the nearest of 216 distributors. For name, write us.

ACTUAL SIZE ½" YARWAY STEAM TRAP

YARNALL-WARING COMPANY
137 Mermaid Ave., Philadelphia 18, Pa.

FREE OFFER. Don't take our word for it. Test Yarway's advantages in your own plant, without cost or obligation. Drop us a card or letter—a trial trap will be delivered promptly.

YARWAY the steam trap
designed with more production in mind

The quick opening feature of this Aloyco No. 111 A gate valve is positive acting, may be locked in any position
in corrosive
service
This quick-opening gate valve is one of a wide range of ALOYCO valves recommended for severe corrosive service
A. metallurgical research devoted exclusively to corrosive applications;
B. foundry and machine shop facilities set up for high alloy valves only;
C. casting and machining practices governed by the special characteristics of the alloys required for corrosive services.

Success Stories from ALOYCO's Corrosion Clinic

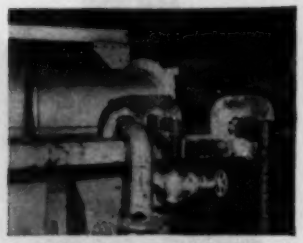
THE CORROSIVE: Concentrated sulfuric acid.

THE APPLICATION: Supply line to continuous cold sheet pickler.

THE PLACE: Largest steel mill on Eastern seaboard.

THE VALVES: Two ALOYCO 20 globe valves.

THE RESULTS: Former cast-iron valves gave trouble sticking and freezing, both open and shut, and required frequent replacement, losing production time. Original ALOYCO 20 valves have eliminated this difficulty entirely. Customer has replaced all cast-iron valves in this service with ALOYCO.



ALOYCO globe valve on sulfuric acid supply line to continuous sheet pickler.

THE BACKGROUND: When a customer can report "Best acid valve I've ever seen", that's good evidence that the special procedure ALOYCO uses in making corrosion-resistant valves pays off in lower valve costs and protected product purity.

ALOYCO *concentrates* on valves for corrosive services. We make no other types. Our foundry practices, our machines and our tools are designed for the production of high alloys alone.

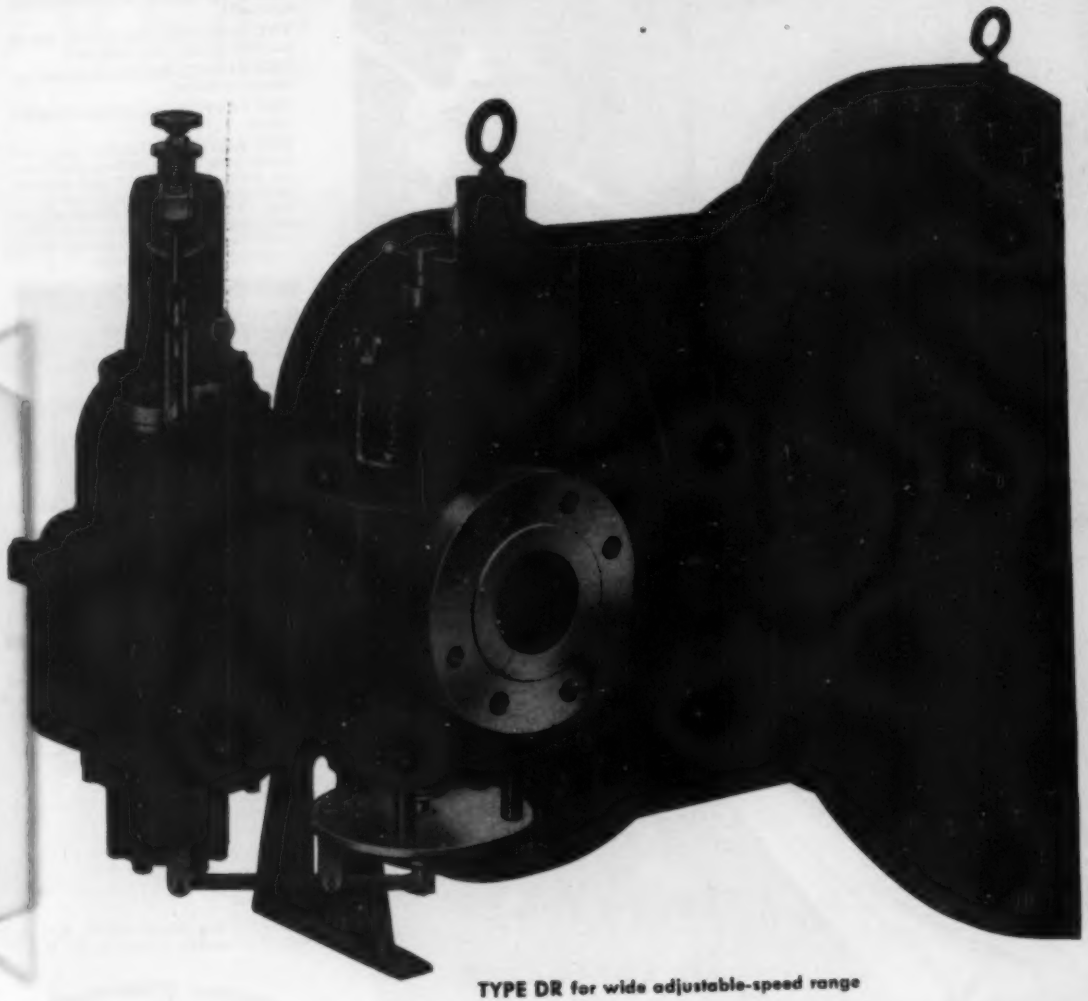
And our *Aloyco Corrosion Clinic* specializes on problems of corrosion, contamination, discoloration, high and low temperature service.

If you have such problems in your plant, put them up to the *Aloyco Corrosion Clinic* for "diagnosis" and "treatment".

ALLOY STEEL PRODUCTS CO., INC.
1301 West Elizabeth Avenue, Linden, N. J.

Longer Lasting
ALOYCO VALVES
1st in Corrosive Service

GENERAL ELECTRIC ANNOUNCES New



TYPE DR for wide adjustable-speed range

Multi-Stage Turbines

Available in Four Designs—200 to 5000 hp

Now in production! General Electric's completely new, multi-stage turbine drives . . . designed to give you maximum mechanical power for every fuel dollar . . . available to meet any mechanical drive application where efficiency and reliability are "musts."

FOUR NEW TYPES—The DP, DR, DRV, DRVX—incorporate the newest ideas in improved turbine design. Four different governing systems give you a wide selection of performance ratings for either condensing, noncondensing or automatic extraction applications.

NEW FEATURES that spell increased economy and reliability are built into General Electric's new multi-stage turbines. A completely new sectional valve gear, for instance, gives you greater efficiency for part load operation. Refinements in governing, lubrication and steam chest design make these the finest mechanical-drive turbines General Electric has ever produced.

A NEW TECHNIQUE of manufacturing from standard, interchangeable patterns promises you savings in initial investment and shortened delivery time. You get a custom turbine, designed for your job, built from standard parts.

Get the full particulars on these brand new multi-stage turbine drives. Write for your copy of our new bulletin, GEA-5580, "G-E Multi-Stage Turbine Drives." Section 252-52, General Electric, Schenectady 5, N.Y.

252-52

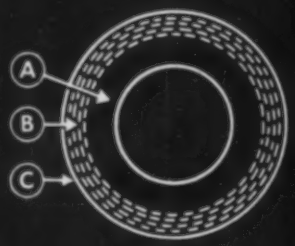
GENERAL ELECTRIC

The Hose Acid Can't Harm

GOODYEAR INDUSTRIAL RUBBER PRODUCTS

GT-Specified STYLE M ACID-CONDUCTING HOSE

for GENERAL CHEMICAL SERVICE



A – Tube of long-lived, acid-resistant stock; withstands temperatures up to 150° F. (See table below.)

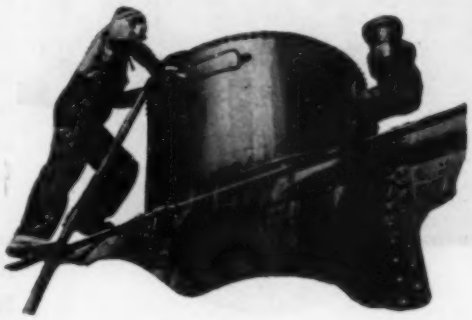
B – Fabric carcass, each ply frictioned with high quality rubber firmly bonding tube to cover. Protected against chemical attack by heavy rubber cap at each end.

C – Cover of tough, abrasion-resistant black compound, proof against same chemicals as tube.

GOODYEAR STYLE M HOSE
Handles All These Chemicals

	Maximum Concentration	Maximum Temperature °F
ACIDS		
Arsenic	All	150
Acetic	50%	100
Carbonic	50%	150
Citric	All	150
Fluoboric	All	150
Fluosilicic	All	150
Formic	All	100
Hydrobromic	All	100
Hydrofluoric	All	100
Malic	All	150
Phosphoric	75%	150
Sulfuric	50%	125
Tannic	All	150
Tartaric	All	150
Hydrochloric	All	125
CANNOT HANDLE NITRIC ACID		
BASES		
Ammonium Hydroxide	50%	100
Calcium Hydroxide	All	150
Magnesium Hydroxide	All	150
Potassium Hydroxide	All	150
Sodium Hydroxide	All	150
SALTS		
Calcium Hypochlorite	All	150
Copper Sulphate	All	150
Ferric Chloride	All	150
Sodium Acid Sulphate	All	150
Sodium Carbonate	All	150
Sodium Chloride	All	150
Trisodium Phosphate	All	150
Sodium Sulphide	All	150
Sodium Sulphite	All	150

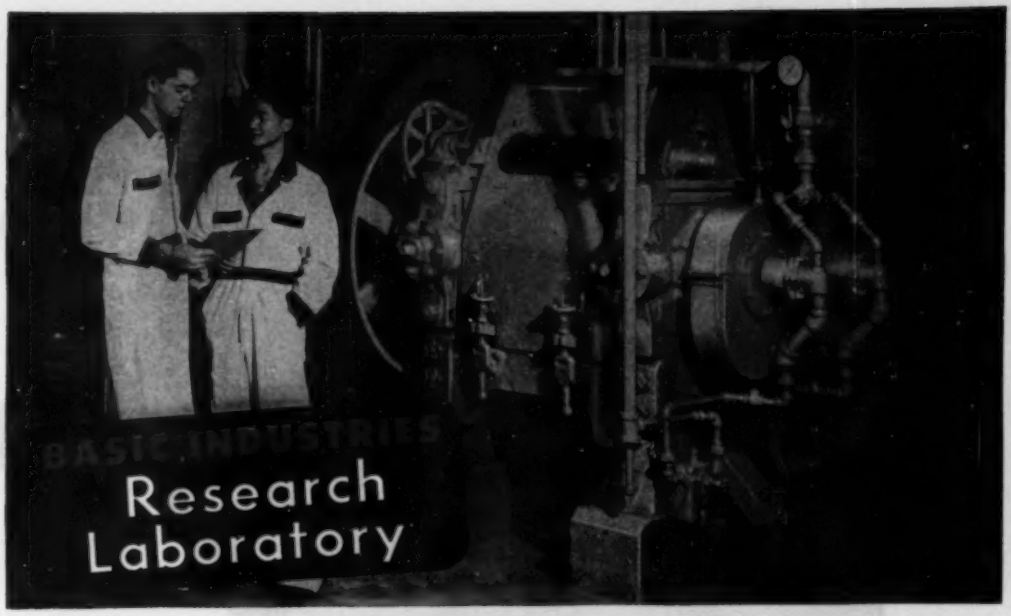
FOR HOSE, FLAT BELTS, V-BELTS, MOLDED GOODS, PACKING, TANK LINING, RUBBER-COVERED ROLLS built to the world's highest standard of quality, get in touch with the G.T.M.—Goodyear Technical Man—or phone your nearest Goodyear Industrial Rubber Products Distributor.



We think you'll like "THE GREATEST STORY EVER TOLD"—Every Sunday—ABC Network

GOODYEAR

THE GREATEST NAME IN RUBBER



How Lab Tests Helped Develop New Product

A PHARMACEUTICAL manufacturer had developed a vegetable gum — derived from seeds of a tropical plant — which was in considerable demand for use as a base in medicines, foods and paper sizings.

The gum had been successfully extracted and cleaned. The resultant product, however, was excessively gummy. Unless a way could be found to render it suitable for grinding, it could not be put up in a marketable form.

This problem was brought to the Basic Industries Laboratory. After preliminary experiments, it was found that a carefully controlled flaking mill process could produce a product that was sufficiently friable to be ground easily.

Batch tests were followed by a pilot mill test which indicated that the process would be commercially practical.

As a result of the laboratory tests, this manufacturer was able to proceed with confidence in setting up full-scale equipment for this process.

CAN YOU USE THESE FACILITIES?

The Allis-Chalmers Basic Industries Laboratory was established to help you work out profitable solutions to processing problems. It contains modern equipment for batch and pilot mill tests in grinding, crushing, sizing, concentrating, jigging, pyro-processing, chemical and physical analysis.

The Laboratory's purpose is to develop new or more efficient processing methods... to determine the economics of a process prior to full scale operation . . . to provide engineering information to guide in designing efficient plants.

Facilities of the Laboratory are available to anyone in industry. Charges are based on costs. Estimates for test work can be obtained from A-C district offices or from Allis-Chalmers Basic Industries Laboratory, Milwaukee 1, Wis.

Send For Your Copy Today

Laboratory Bulletin 07B6419B

Allis-Chalmers Mfg. Co.
Milwaukee 1, Wis.

Name

Company

Position

Address

City State A-3401

ALLIS-CHALMERS

Basic Industries Research Laboratory — Dedicated to a Better Utilization of our Raw Materials

Bonderizing and 4 protective coatings *ADD SERVICE LIFE*

All exposed parts of the Life-Line chemical motor are Bonderized. We know of no other motor manufacturer who assures longer life in chemical service with this extra protection. After Bonderizing, a special formaldehyde-alkyd type enamel is applied; then two coats of Thermoset varnish; finally a coat of dark-gray lacquer. On-the-job performance proves this is the best type of motor for chemical service.

"Longer Life...
in chemical service" say these Life-Line users

More and more plant operators confronted with the problem of operating motors for chemical processing are switching to Life-Line. They find that Life-Lines operate with less maintenance—AND have a greater life span. Here is an example:

Lubrication is a perpetual problem on a green liquor pump at the Weyerhaeuser Timber Company. Various concentrations of caustic and lime dust, together with frequent water splashing turn grease and oil into a soapy substance—useless for lubrication purposes. This problem has been eliminated, as far as the motor is concerned, by the installation of a Life-Line motor. The Life-Line has sealed, pre-lubricated bearings—keeps foreign matter out—needs no lubrication.

Proof of performance like this means your best buy for chemical motors is Life-Line. They are available in a complete range of enclosures . . . open—dripproof—splashproof—totally-enclosed fan-cooled—totally-enclosed non-ventilated. All have steel frames to effectively resist corrosion. All have sealed, pre-lubricated bearings that keep out destructive elements.

Cut down your motor replacement cycle with Life-Line. Your Westinghouse representative will show you how. Call him today or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-21634

Stainless must go a long way, too!

To meet the demands of national defense and civilian needs, stainless must go a long way. That's why, now, more than ever—if you use stainless—use it wisely and efficiently.

Stainless is a name given to a broad list of grades and finishes—therefore, careful selection of the best available materials for your job is of prime importance. Here Crucible, a pioneer in the development of stainless steels, can help you get the most out of your share of stainless stocks through the unparalleled experience of our metallurgists and stainless fabricating specialists.

And when you can't get the grade of stainless you need, Crucible technical personnel can give you sound advice on the best available materials.

Until the time when stainless is more freely available . . . stretch your supplies of stainless. To do this . . . make use of Crucible's wealth of stainless steel experience.

CRUCIBLE first name in special purpose steels

51 years of *Fine* steelmaking

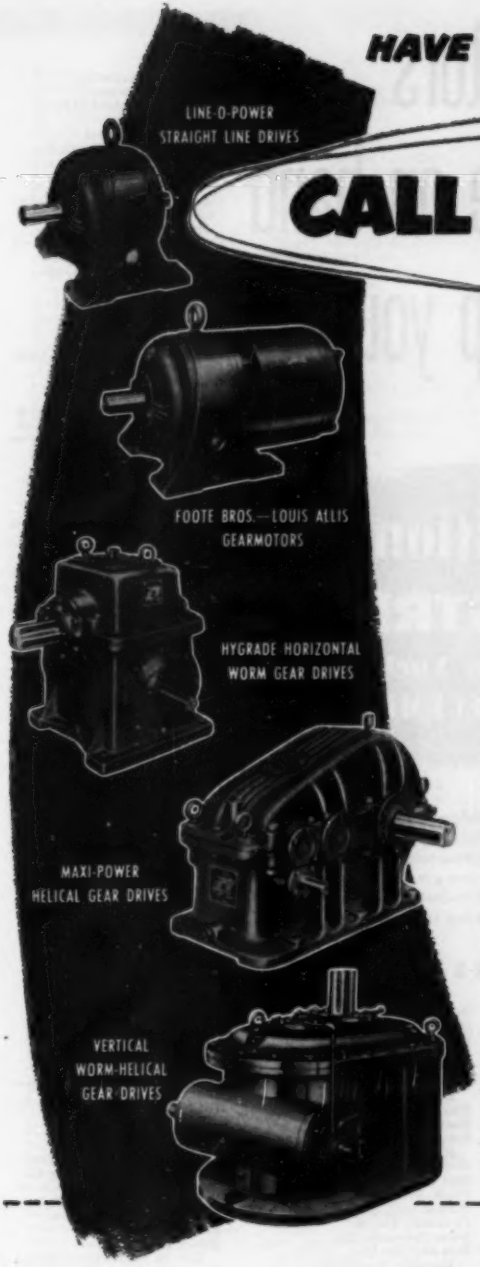
STAINLESS STEELS

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

STAINLESS • REX HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

HAVE YOU A DRIVE PROBLEM?

CALL FOOTE BROS.



Compact, small size units for use on original equipment—husky horizontal or vertical worm gear drives—heavy duty helical gear drives up to approximately 1000 h. p.—gearmotors. Whatever your requirements in power transmission, you will find exactly what you need in the complete Foote Bros. line.

Three large plants, containing the latest in gear cutting equipment, are backed by nearly a century of engineering and manufacturing experience. New techniques, better control of material, improved manufacturing methods—all assure superior enclosed gear drives. Check the coupon for the bulletins in which you are interested.

FOOTE BROS. GEAR AND MACHINE CORPORATION
Dept. O, 4545 S. Western Ave. • Chicago 9, Illinois

LINE-O-POWER STRAIGHT-LINE DRIVES
Economical in original cost and operation. Duti-Rated Gears have file-hard tooth surfaces and ductile cores, assuring long life. Double or triple reductions, with ratios from 5 to 1 up to 238 to 1 and capacity range from 1 up to 200 horsepower.

FOOTE BROS.—LOUIS ALLIS GEARMOTORS
A compact line of gearmotors in 17 sizes in single, double and triple reductions, incorporating Duti-Rated Gears that assure long wear life and maximum load-carrying capacity. Available with Louis Allis open drip-proof, splash-proof, enclosed and explosion-proof motors.

HYGRADE WORM GEAR DRIVES
Heavy duty drives with precision worm gearing that assures high efficiency and load-carrying capacity. Horizontal, vertical and Hytop (extended shaft) types. Ratios from 4⅛ to 1 up to 4,108 to 1. Capacity up to 260 horsepower.

MAXI-POWER HELICAL GEAR DRIVES
Heavy-duty helical gear drives. Available in single reduction units, ratios up to 9.91 to 1; capacities up to 1,550 horsepower; double-reduction units, ratios from 9.32 up to 71 to 1, capacities to 1100 horsepower; triple reduction units, ratios from 79 up to 360 to 1, capacities up to 420 horsepower.

WORM-HELICAL GEAR DRIVES
Heavy duty vertical drives with horizontal input shafts and vertical output shafts—up or down. Ratios from approximately 25 to 285 to 1 and a capacity range up to 128 horsepower.

Foote Bros. Gear and Machine Corporation
Dept. CE, 4545 South Western Boulevard
Chicago 9, Illinois

- ☐ Bulletin HGA Hygrade Worm Gear Drives
- ☐ Bulletin LPB Line-O-Power Straight Line Drives
- ☐ Bulletin MPB Maxi-Power Helical Gear Drives
- ☐ Bulletin GMA Foote Bros.-Louis Allis Gearmotors
- ☐ Bulletin WHA Worm-Helical Gear Drives

Name.....*Position*.....
Company.....
Address.....
City.....*Zone*.....*State*.....

FOOTE BROS.
Better Power Transmission Through Better Gears

over 400 Exhibitors will be on hand to help you at the

23rd Exposition of CHEMICAL INDUSTRIES

Grand Central Palace • New York City

NOVEMBER 26 to DECEMBER 1

CONFUSED by latest material regulations? Hampered by shortages? Bothered by process or production problems? Bring your troubles to this great informative exposition of over 400 companies . . . discuss them with technical men representing nearly 250 different classifications of equipment, materials, supplies, and services for all chemical processing industries. In no other way can you get so much help on so many phases of industrial chemistry and chemical engineering in so little time.

LIST OF EXHIBITORS

Aetna Scientific Co.
Alberene Stone Corp. of Va.
Alleghany Ludlum Steel Corp.
Allis-Chalmers Mfg. Co.
Allis Co., Louis
Alloy Steel Products Co.
Aloe Scientific, Div. of A. S. Aloe Co.
Alsop Engineering Corp.
Aluminum Co. of America
American Air Filter Co., Inc.
American Balance Corp.
American Bridge Co.
American Chemical Society
American Chemical Society News Service
American Hard Rubber Co.
American Instrument Co., Inc.
American Monomer Corp.
American Optical Co. Instrument Division
American Platinum Works
American Polymer Corp.
American Resinous Chemicals Corp.
American Sterilizer Co.
American Tool & Machine Co.
American Wheelabrator & Equipment Corp.
Amersil Co., Inc.
Ampco Metal, Inc.
Analytical Chemistry
Andrews-Knapp Construction Co. Inc.
Angel & Co., Inc., H. Reeve
Ansul Chemical Co.
Arrow-Hart & Hegeman Electric Co.
Artisan Metal Products, Inc.
Associated Cooperage Industries of America, Inc.
Atlas Powder Co.
Austenal Laboratories, Inc. Mikrocast Div.
Autoclave Engineers, Inc.
Bailey Meter Co.
Baird Associates, Inc.
Baker & Co., Inc.
Baker Perkins Inc.
Barco Manufacturing Co.
Barco Oil Co.—Wax Div.
Barnstead Still & Sterilizer Co.
Barrett-Cravens Co.
Bartlett & Snow Co., C. O.
Bean Division, John, Food Machinery & Chemical Corp.
Beckman Instruments, Inc.
Beico Industrial Equipment Div., Inc.
Belgian Electric Sales Corp.
Bemis Bro. Bag Co.
Berger Manufacturing Div., Republic Steel Corp.
Bersworth Chemical Co.
Bird Machine Co.
Black, Sivalls & Bryson, Inc.
Blaw-Knox Co.
Blickman, Inc., S.
Boler Petroleum Co.
Bolt and Nut Div., Republic Steel Corp.
Bowen Engineering, Inc.
Bowser, Inc.
Brabender Corp.
Bramley Machinery Corp.
Branson Instruments, Inc.
Brinkmann & Company, C. A.
British American Carbon Corp.
Brooks Rotameter Co.
Brush Development Co.
Buffalo Apparatus Corp.
Buffalo Meter Co.
Buflovak Equipment, Div. of Blaw-Knox Co.
Builders-Providence, Inc.
Burling Instrument Co.
Cambridge Instrument Co., Inc.
Cameron Iron Works, Industrial Valve Div.
Carbide and Carbon Chemicals Co., A Div. of Union Carbide & Carbon Corp.
Carpenter Steel Co. Alloy Tube Div.
Carver, Inc., Fred S.
Central Scientific Co.
Centrico, Inc.
Chamberlain Engineering Corp.
Chase Equipment Corp.
Chemical Abstracts
Chemical Engineering
Chemical Engineering Catalog
Chemical & Engineering News
Chemical Engineering Progress
Chemical Materials Catalog
Chemical Processing
Chemical Pump & Equipment Corp.
Chemical Week
Chemicolloid Laboratories, Inc.
Chilsan Co.
Cleaver-Brooks Co.
Cleveland Worm and Gear Co.
Coleman Instruments, Inc.
Colton Co., Arthur, Div. of Snyder Tool & Engrg. Co.
Combustion Engineering-Superheater, Inc.
Commercial Filters Corp.
Commercial Solvents Corp.
Conkey Filter Unit General American Transportation Corp.
Connecticut Rubber & Plastics Corp.
Consolidated Engineering Corp.
Container Company, Div. Continental Can Co., Inc.
Continental-Diamond Fibre Co.
Cooper Alloy Foundry Co.
Corning Glass Works
Cowles Company
Crane Co.
Croll-Reynolds Co., Inc.
Crucible Steel Co. of America
Culvert Div. Republic Steel Corp.
Cyclone Fence Div. American Steel & Wire Co.
Darco Department Atlas Powder Co.
Day Company
Day Company Inc., J. H.
DeLaval Separator Co.
DeZurik Shower Co.
Dicalite Div. Great Lakes Carbon Corp.
Dorr Co.
Dracco Corp.
Duriron Co., Inc.
Eagle-Picher Sales Co.
Eastern Industries Inc.
Eastern Stainless Steel Corp.
Eclipse Fuel Engineering Co.
Eco Engineering Co., Div. of Economy Faucet Co. Inc.
Economic Machinery Co.
Eimco Corporation
Eimer and Amend Div. of Fisher Scientific Co.
Electric Hotpack Co. Inc.
Elenite Products Inc.
Emery Industries, Inc.
Energy Control Co., Inc.
Engelhard, Inc., Charles
Entoleter Div.—Safety Car Heating & Lighting Co., Inc.
Enzinger Union Corp.

Management International Exposition Company

Ercona Corp.
Erie Manufacturing Co.
Ertel Engineering Corp.
Exact Weight Scale Co.
Exolon Company

Falstrom Company
Fansteel Metallurgical Corp.
Ferris Engineering Corp.
Farval Corporation
Federal Refractories Corp.
Fenwal Inc.
Filtration Engineers Inc.
Fischer & Porter Co.
Fitzpatrick Co., W. J.
Fletcher Works, Inc.
Flexible Valve Corp.
Flexitallic Gasket Co.
Food Engineering
Food Processing
Foote Mineral Co.
Foxboro Co.
Fuller Co.
Fulton Bag & Cotton Mills
Furnas Electric Co. Inc.

Garlock Packing Co.
General Alloys Co.
General American Transportation Corp.
General Ceramics & Steatite Corp.
General Electric Company Apparatus Department Chemical Department
General Laboratory Supply Co.
General Scientific Equipment Co.
Gerrard Steel Strapping Co.
Glascote Products, Inc.
Glengarry Processes, Inc.
Goslin Birmingham Mfg. Co., Inc.
Graver Water Conditioning Co. Div. of Graver Tank & Mfg. Co. Inc.
Great Lakes Carbon Corp. Dicalite Division
Great Western Mfg. Co.
Greif Bros. Cooperage Corp.
Grinnell Co., Inc.
Groen Mfg. Co.
Gump Co., B. F.

Hanovia Chemical & Mfg. Co.
Hardinge Company, Inc.
Hardinge Manufacturing Co.
Hart-Moisture-Meters
Hasco Valve and Machine Co.
Haveg Corp.
Haynes Stellite Company, A Div. of Union Carbide & Carbon Corp.
Heil Process Equipment Corp.
Hercules Filter Corp.
Hercules Powder Co.
Hetherington and Berner Inc.
Hills-McCanna Co.
Hoke Inc.
Hormann & Co. Inc., F. R.
Hough Co., Frank G.

I-T-E Circuit Breaker Co.
Illinois Testing Laboratories, Inc.
Illirois Water Treatment Co.
Industrial & Engineering Chemistry
Industrial Instruments, Inc.
Industrial Products Engrg. Co.
Industrial Steels, Inc.
Ingersoll-Rand Co.
Instrument Development Laboratories
Eppenbach, Inc.
International Boiler Works Co.
International Nickel Co., Inc.

Jabsco Pump Co.
Jacoby, M. E., Henry E.
Jacoby-Tarbox Corp.
Jeffrey Manufacturing Co.
Jerguson Gage & Valve Co.
Johns-Manville Sales Corp.

Kathabar Div. Surface Combustion Corp.
Kaylo Div. Owens-Illinois Glass Co.
Keiding Paper Products Co.
Kern Co.
Kewaunee Mfg. Co.
Kidde & Co., Inc., Walter
Kiefer Machine Co., Karl
Kimble Glass, Div. of Owens-Illinois Glass Co.
Kinney Manufacturing Co.
Klein Filter & Mfg. Co.
Knapp Mills, Inc.
Knight, Maurice A.
Kontes Glass Co.
Koven & Brother, Inc., L. O.
Kurhan Co., Inc.

Laboratory Furniture Co. Inc.
LaBour Company, Inc.
Ladish Co.
Lakso Company, Inc.
Lapp Insulator Co. Inc. Process Equipment Div.
Lawrence Machine and Pump Corp.
Lead Lined Iron Pipe Co.
Lebanon Steel Foundry
Leslie Co.
Link-Belt Co.
Louisville Drying Machinery Co. Unit—General American Transportation Corp.
Lukens Steel Co. and its Lukenweld Div.
Luzerne Rubber Co.
Lydon Brothers, Inc.

McGraw-Hill Book Co., Inc.
McGraw-Hill Publishing Co.

M R M Company, Inc.
Macbeth Corp.
Machlett & Son, E.
Magnetrol, Inc., Div. of Fred H. Schaub Engrg. Co.
Manton-Gaulin Mfg. Co.
Marsh Stencil Machine Co.
Martindale Electric Co.
Materials and Methods
Matheson Company, Inc.
Merco Centrifugal Co.
Meriam Instrument Co.
Metalab Equipment Corp.
Metal-Glass Products Co.
Micro Metallic Corp.
Milton Roy Co.
Mine Safety Appliances Co.
Minneapolis-Honeywell Regulator Co. Industrial Div.
Mixing Equipment Co. Inc.
Monarch Manufacturing Works, Inc.
Monsanto Chemical Co.
Moore Company, J. Arthur
Mundet Cork Corp.

Nash Engineering Co.
National Carbon Company, A Div. of Union Carbide & Carbon Corp.
National Engineering Co.
National Lead Co.
National Tube Co.
Newark Wire Cloth Co.
New Brunswick Scientific Co.
New England Tank & Tower Co.
New Jersey Machine Corp.
New York Laboratory Supply Co. Inc.
Niagara Blower Co.
Niagara Filter Corp.
Nichols Engrg. & Research Corp.
Niles Steel Products Div. Republic Steel Corp.
Norcross Corp.
Norton Company

Ohio Chemical & Surgical Equip. Co.
Oliver United Filters Inc.
Omega Machine Co.
Oronite Chemical Co.
Overstrom & Sons

Palmer Thermometers, Inc.
Palo Laboratory Supplies, Inc.
Pangborn Corp.
Parker Appliance Co.
Patterson Foundry & Machine Co.
Patterson-Kelley Co. Inc.
PerfeKtum Products Co.
Perkin-Elmer Corp.
Perl Machine Mfg. Co.
Perlite Div. Great Lakes Carbon Corp.
Permutit Company
Pfaudler Company
Pfizer & Co. Inc., Chas.
Philadelphia Gear Works, Inc.
Photovolt Corp.
Pioneer Div. Scott & Williams, Inc.
Pittsburgh Corning Corp.
Pittsburgh Equitable Meter Div. Rockwell Manufacturing Co.
Platecoil Div. of Kold-Hold Manufacturing Co.
Plate & Welding Div. General American Transportation Corp.
Pneumatic Scale Corp., Ltd.
Podbielniak, Inc.
Popper & Sons, Inc.
Potts Co., Horace T.
Powell Company, Wm.
Prater Pulverizer Co.
Precision Scientific Co.
Premier Mill Corp.
Pressed Steel Tank Co.
Proctor & Schwartz, Inc.
Productive Equipment Corp.
Progressive Architecture
% Proportioneers, Inc. %
Pulva Corp.
Pulverizing Machinery Co.
Putman Publishing Co.

Radio Corporation of America
Raymond Pulverizer Div. Combustion Engineering-Superheater, Inc.
Read Standard Corp. Bakery-Chemical Div.
Reeves Pulley Co. of N. Y. Inc.
Reichhold Chemicals, Inc.
Reinhold Publishing Corp.
Reliance Electric & Engrg. Co.
Republic Lead Equipment Co.
Republic Seitz Filter Corp.
Republic Steel Corp.
Ribble & Co., C. H.
Richmond Manufacturing Co.
Rietz Manufacturing Co.
Robbins & Myers, Inc.
Robinson Orifice Fittings Co.
Roseveor Co., M. B.
Ross & Son Co., Charles
Ruggles-Coles Engineering Co.

Sadtler & Son, Inc., Samuel P.
Saran Lined Pipe Co.
Sarco Company, Inc.
Schmieg Industries, Inc.
Schneible Company, Claude B.
Schutte & Koerting Co.
Scientific Development Co.
Scientific Glass Apparatus Co. Inc.
Seederer-Kohlbusch, Inc.
Selas Corp. of America
Separations Engineering Corp.
Sharples Corp.
Sheldon & Co., E. H.
Shriver & Co., Inc., T.
Simplicity Engineering Co.
Sjostrom Co., John E.
Sly Mfg. Co. Inc., W. W.
Snell, Inc., Foster D.
Snyder Chemical Corp.
Socony-Vacuum Oil Co.
Southern Scientific Co. Inc.
Sparkler Manufacturing Co.
Sperry & Company, D. R.
Sprout, Waldron & Co.
Standard Scientific Supply Corp.
Standard Steel Corp.
Steel and Tubes Div. Republic Steel Corp.
Stephens-Adamson Mfg. Co.
Stokes Machine Co., F. J.
Sturtevant Mill Co.
Superior Electric Co.
Sutton, Steele & Steele, Inc.
Swenson Evaporator Co. Div. of Whiting Corp.
Swanson & Co., W. H.
Syntron Co.

Tank Car Div.
Tank Storage Div. General American Transportation Corp.
Technicon Chromotography Corp.
Tennessee Eastman Co. Div. of Eastman Kodak Co.
Titanium Alloy Mfg. Div. National Lead Co.
Titeflex, Inc.
Toledo Scale Co.
Tolhurst Centrifugals Div. American Machine & Metals, Inc.
Trent, Inc.
Tri-Clover Machine Co.
Tri-Homo Corp.
Tripard Manufacturing Co. Inc.
Troy Engine & Machine Co.
Truscon Steel Co.
Tube Turns, Inc.
Turbo Mixer, a Div. of General American Transportion Corp.
Tyler Co., The W. S.

Uehling Instrument Co.
Union Drawn Steel Division Republic Steel Corp.
Union Iron Works
Union Process Co.
U. S. Electrical Motors, Inc.
United States Steel Co.
United States Steel Export Co.
United States Steel Products Co.
United States Steel Supply Co.
United States Stoneware Co.

VanNostrand Co., Inc., D.
Vanton Pump Corp.
Victor Chemical Works
Vogt Machine Co., Henry

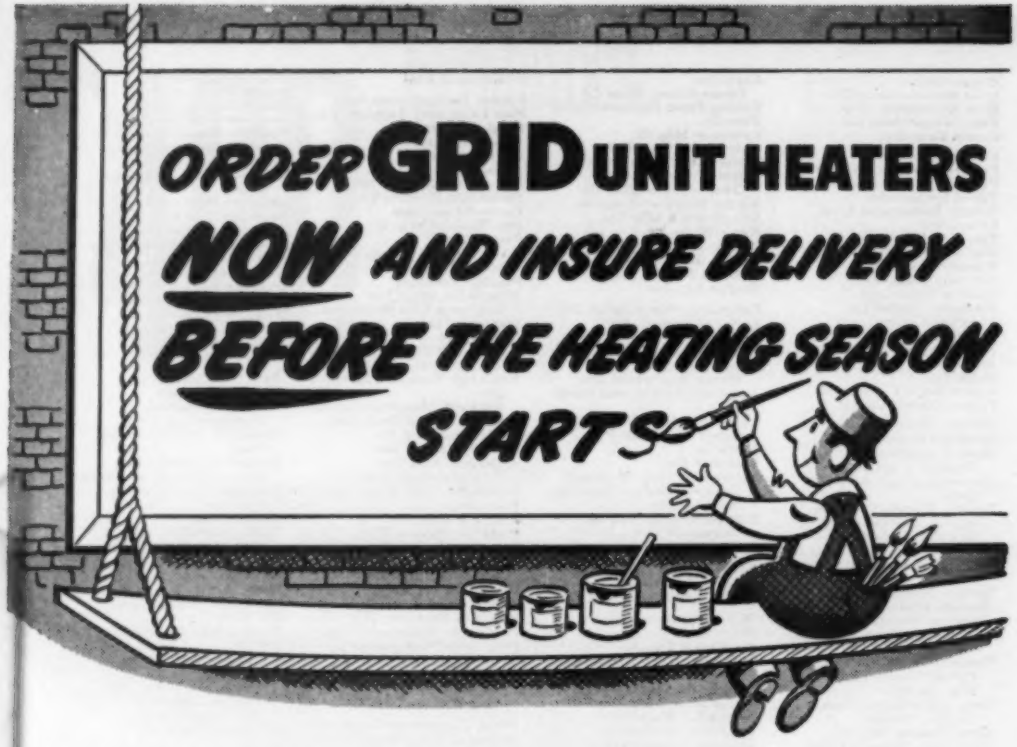
Walker-Wallace, Inc.
Wallace & Tiernan Co. Inc.
Walworth Company
Watson-Stillman Co.
Welch Mfg. Co., W. M.
Westinghouse Electric Corp.
Weston Electrical Instrument Corp.
Wiegand Company, Edwin L.
Wiggins Gasholder Div.
Wiggins Vapor Seal Div. General American Transportation Corp.
Will Corporation
Williams Patent Crusher and Pulverizer Co.
Wilson Products, Inc.
Worthington Pump & Machinery Corp.

York Company, Inc., Otto H.

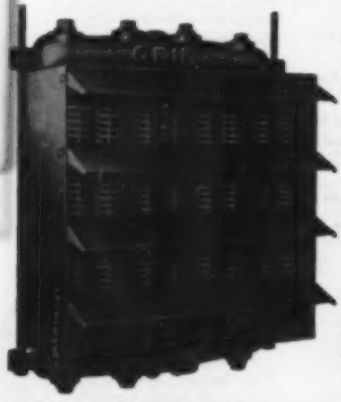
Plan to Attend — Something Worthwhile for Everyone in Every Phase of Industrial Chemistry

Management International Exposition Company

ORDER GRID UNIT HEATERS NOW AND INSURE DELIVERY BEFORE THE HEATING SEASON STARTS



Double your money's worth — if you order GRID Unit Heaters NOW — in advance of the regular heating season, because our inventory on GRID Unit Heaters is the best in years. And, GRID Unit Heaters are the best heating buy from the standpoint of maintenance-free service and low cost of operation. There is no waiting for delivery on GRID Unit Heaters and there is no maintenance after you get them, because . . .



GRID cast iron construction withstands corrosive fumes.

GRID wide fin spacing facilitates easy cleaning.

GRID will withstand steam pressures up to 250 lbs., and is free of electrolysis.

GRID fins are cast integral with the steam chamber assuring even distribution of heat. It's not possible for GRID fins to come loose from the steam chamber to cause loss of heating efficiency.

GRID design incorporating proper fan sizes, motor speeds and outlet temperatures results in a properly balanced heating unit, especially when high steam pressures are used.

Consult our Engineering Department and Sales representatives for advice on heating problems, including Unit Heaters, Blast Coils and Radiation. Send for complete catalog . . . no cost . . . no obligation.

THE UNIT HEATER WITH HIGH TEST CAST IRON HEATING SECTIONS . . . FREE OF ELECTROLYSIS

D. J. MURRAY MANUFACTURING CO.

MANUFACTURERS SINCE 1883

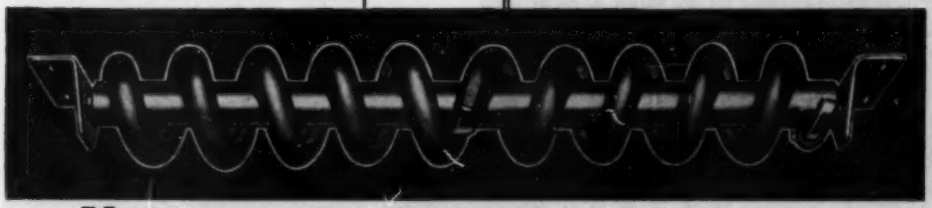
WAUSAU • WISCONSIN

this record proves

THE RETURNS FROM REX SPIRAL RETURN IDLERS

COST RECORD (In a large western coke plant)

TYPE OF IDLER	Steel	Rubber Covered Spiral
SERVICE LIFE	3 months	12 months
COST 1st YEAR	$66.80 for 4	$47.70 each
SAVING 1st YEAR		$19.10
Cost of Replacement		
Subsequent Years (per year)	$66.80 for 4	$18.20 each (rubber covering)
SAVING per year after 1st YEAR		$48.60



Yes, the cost record from *just* this one plant clearly demonstrates the savings possible through the installation of Rex Rubber Covered Spiral Return Idlers.

Before the installation of these cost-cutting idlers, the abrasive action of coke breeze clinging to the return side of the belts wore out the standard steel return idlers in an average 3-month period.

15 Rex Spiral Return Idlers were installed for trial and have given at least 12 months' service—4 times longer than the steel idlers. These idlers provide a constant, ever-changing point of contact between idler and belt, preventing build-up of material on the idler and, in some cases, helping to clean the belt.

Cost records show that the 15 Rex Spiral Return Idlers made possible a saving of $19.10 per idler and $286.50 total saving, including initial and installation costs. After the first year, the spiral rubber covering can be replaced, if worn, at a cost of $18.20 per idler. This cost as compared to $66.80, the cost of 4 new steel return idler rolls, indicates a saving after the initial year of $48.60 per year.

Add to these savings, the elimination of down-time caused by the frequent replacement of steel idler rolls, which makes the cost-cutting advantages of Rex Rubber Covered Spiral Return Idlers even more obvious.

Why not investigate the advantages of Rex Spiral Return Idlers and the other idlers in the Rex Line for your operations? Mail the coupon for your copy of Bulletin No. 463R.

Rex Rubber Covered Spiral Return Idlers installed in this western coke plant delivered 4 times longer service than conventional steel return idlers previously used.

CHAIN BELT REX COMPANY — BELT CONVEYOR IDLERS

Chain Belt Company 50-214
1648 W. Bruce Street
Milwaukee 4, Wis.

Please send me a copy of Bulletin 51-80

Name.....

Company.....*Dept*.....

Address.....

City.....*State*.....

How 'Telephone' Solved the Bunker Problem

TELEPHONE companies have to be tough customers when it comes to oil burning equipment. They demand a plant which will give them heat at any time, even during the summer, for keeping delicate dial mechanisms dry. During hurricanes, blizzards, and other emergencies, the heating equipment cannot fail. ☆ The Bell Laboratories approved the Thermal Electric method for transporting heated bunker fuel in 1938. Since then, six leading Bell subsidiaries have installed it to solve the problem of swift and certain startups after shutdowns of any duration. ☆ The Southern New England Telephone Company has had thirteen years' experience with Thermal Electric. They have found it so successfully met their operating requirements that they've installed it in twenty of their buildings.

How It Works: The Transforming Energizers pass safe 20-volt current through the pipes that carry the fuel, generating heat at 100% efficiency. Thermostats and Control Panels regulate fuel temperature at 120°F., making system fully automatic. The Tank Units remove fuel from *unheated* underground storage tanks. Thermal Electric works with any burner. Southern New England Telephone uses it with Ray, York, Petro, and Johnson burners.

PAT. NO. 2,224,402 CES-4

Thermal Electric

Fluid Systems, Inc., 1881 Dixwell Ave., New Haven, Conn.

Please send without obligation "The Common Sense of Heavy Fuel Transport" plus Customer List of hundreds of users, including telephone companies.

*Name*_____

*Firm*_____

*Street*_____

*City*_____ *State*_____

☐ P.S. Send the proof about that three-year shutdown!

Thermal Electric and Fluid Systems, Inc. are trade marks registered in U.S. Pat. Off.

It starts at a flip of a switch! In one case, Thermal Electric started bunker flowing *immediately* after a *three-year* shutdown! Proof on request.

The Molasses System General Mills Forgot

Recently, we asked the management of General Mills' Buffalo, N. Y., plant how their Thermal Electric System was performing. They said, "Why, it must be okay — we've never paid any attention to it." All they knew was that they always had molasses flowing from their pipes at exactly the right temperature whenever they wanted it. General Mills had practically forgotten the system which pipes their molasses up seven stories at a constant 110°F. for making Betty Crocker GingerCake and Cooky Mix — and it has been in operation for over four years! What better proof could we give you to support Thermal Electric's *guarantee* of PERFECT PERFORMANCE — NO MAINTENANCE. We believe that the General Mills installation, the one the management forgot, is ample demonstration of Thermal Electric's success in handling viscous fluids. What is your fluid problem?

Thermal Electric System for molasses (or *any* fluid transport): Low-voltage current from the Transforming Energizer passes through the pipe walls, maintaining fluid contents at 110°F. and 100% efficiency. Thermal Electric also handles "touchy" fluids at various temperatures for many other leading food manufacturers. Send in for our customer list.

★Thermal Electric equipment by Fluid Systems

Cosmik Fluid Systems, Inc. for specialized engineering aid in designing heated pipe transport of process fluids.

PAT. NO. 2,554,403

Thermal Electric Fluid Systems

CH-4

Fluid Systems, Inc., 1881 Dixwell Ave., New Haven, Conn.

Please send without obligation "Simplified Industrial Fluid Transport Cuts Costs" and Customer List.

*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

Thermal Electric and Fluid Systems, Inc. are trade marks reg. in U.S. Pat. Off.

It's the Nash!

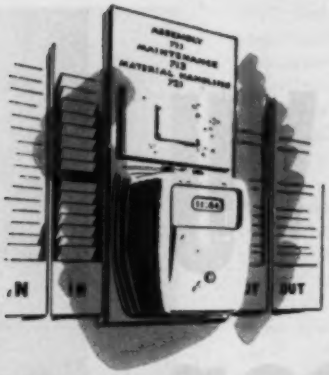
The ability of Nash Compressors to maintain original performance over long periods is no accident. Nash Compressors have but a single moving element, the Nash Rotor. This rotor is precision balanced for long bearing life, and it revolves in the pump casing without metallic contact. Internal lubrication, frequent cause of gas contamination, is not employed in a Nash. Yet, these simple pumps maintain 75 lbs. pressure in a single stage, and afford capacities to 6 million cu. ft. per day in a single compact structure.

Nash Compressors have no valves, gears, pistons, sliding vanes or other enemies of long life. Compression is secured by an entirely different principle of operation, which offers important advantages often the answer to gas handling problems difficult with ordinary equipment.

Nash Compressors are compact and save space. They run without vibration, and compression is without pulsation. Because there are no internal wearing parts, maintenance is low. Service is assured by a nation-wide network of Engineering Service offices. Write for bulletins now.

- No internal wearing parts.
- No valves, pistons, or vanes.
- No internal lubrication.
- Low maintenance cost.
- Saves floor space.
- Desired delivery temperature Automatically maintained.
- Slugs of liquid entering pump will do no harm.
- 75 pounds in a single stage.

NASH ENGINEERING COMPANY
312 WILSON, SO. NORWALK, CONN.



A BOILER THAT PUNCHES THE TIME CLOCK

Yes — a Cleaver-Brooks Boiler "Punches In" to meet a heavy steam demand — "Punches Out" during low load periods.

Steam costs can eat deeply into profits when steam loads fluctuate — or are intermittent. With a Cleaver-Brooks boiler you are equipped for heavy or light . . . steady or variable loads, operating at full 80 per cent efficiency over the entire working range of the boiler.

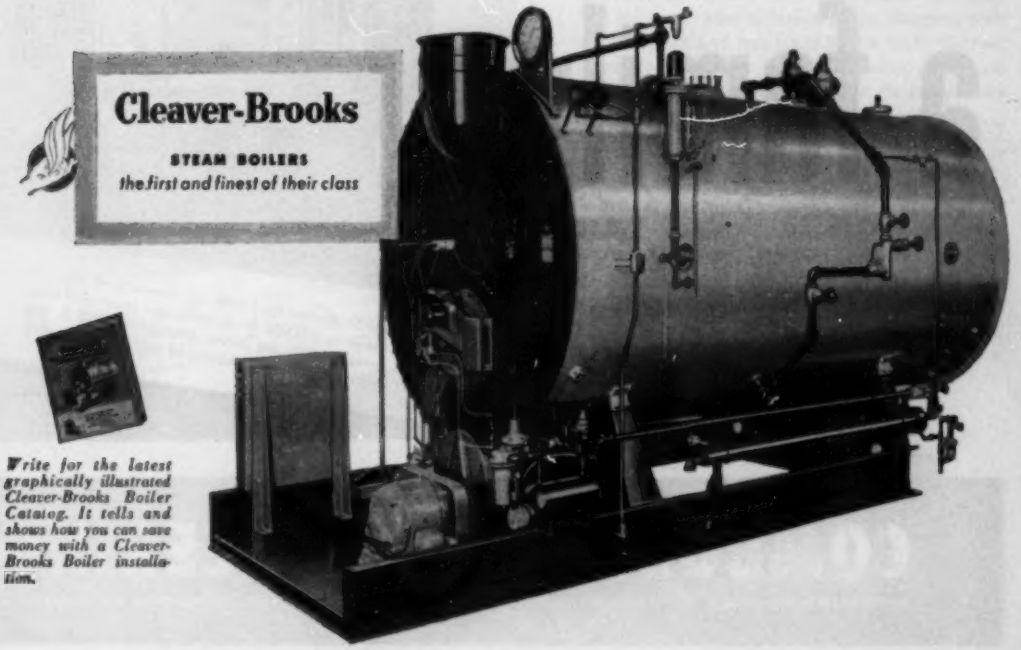
You are assured of fuel economy through high heat transfer. *All* Cleaver-Brooks boilers are of the four pass design and the maximum useable heat is absorbed in these four passes before the combustion gases leave the boiler.

Remember the name Cleaver-Brooks if you are considering a change in your present boiler plant. Think about flexibility and get the complete facts about Cleaver-Brooks Self-Contained Boilers — standard models in 15 to 500 HP, 15 to 250 psi, oil, gas, combination oil and gas fired — 80 per cent efficiency.

CLEAVER-BROOKS COMPANY
853-K E. KEEFE AVE., MILWAUKEE 12, WIS.
Builders of Equipment for the Generation and Utilization of Heat • Steam Boilers • Oil and Bitumen Tank-Car Heaters • Distillation Equipment Oil and Gas-Fired Conversion Burners

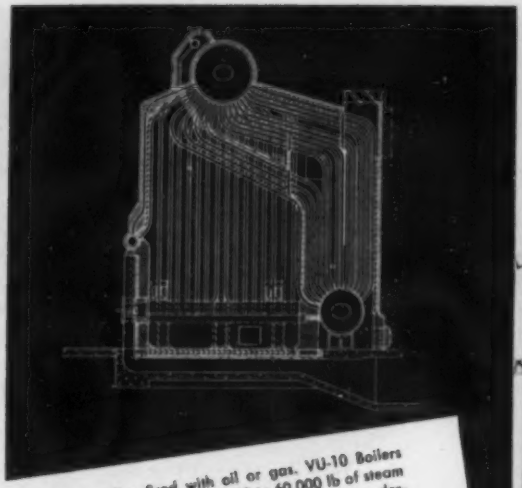
Cleaver-Brooks

STEAM BOILERS
the first and finest of their class

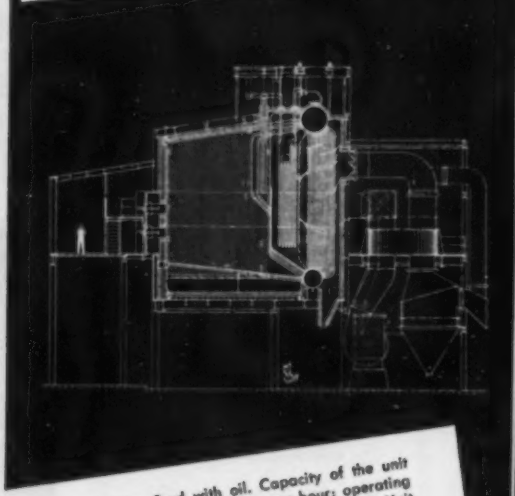


Write for the latest graphically illustrated Cleaver-Brooks Boiler Catalog. It tells and shows how you can save money with a Cleaver-Brooks Boiler installation.

One VU can start a family



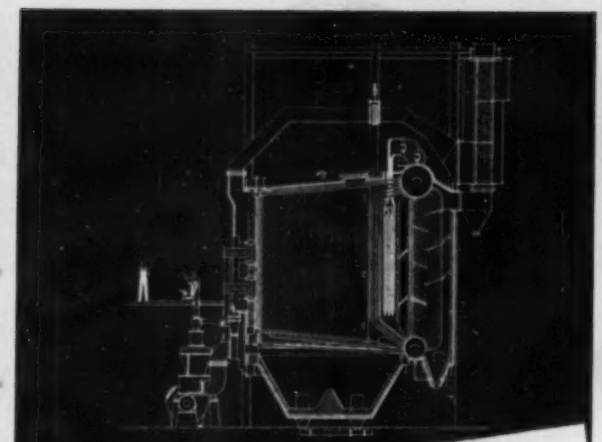
VU-10 Boiler fired with oil or gas. VU-10 Boilers range in capacity from 10,000 to 60,000 lb of steam per hour. They may also be fired by spreader, underfeed or chain grate stokers.



VU-50 Boiler fired with oil. Capacity of the unit shown is 235,000 lb of steam per hour; operating pressure—920 psi; steam temperature—905 F. Unit arranged for future pulverized coal firing if desired.

COMBUSTION ENGINEERING

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS



VU-50 Boiler fired with pulverized coal. The capacity of the unit shown is 60,000 lb of steam per hour; operating pressure—410 psi; steam temperature—700 F. Unit uses oil as an alternate fuel.

VU-50 Boiler tangentially fired with pulverized coal and/or blast furnace gas. Capacity of unit shown—125,000 lb of steam per hour; operating pressure—850 psi; steam temperature—750 F.

With fuel costing what it does today, it is more important than ever before to select a boiler that will assure the most efficient performance possible. That is why so many companies who watch steam costs closely have acquired sizable families of Vertical Unit Boilers. For example:

A Chemical Company ordered two VU Boilers in 1939. In 1946 five more were ordered for three of their other plants. In 1949 another was ordered for one of these same plants, and in 1950 two more units for a fifth plant. In 1951 three more units were ordered for still another plant — thirteen units for six plants in twelve years!

An Electric Utility Company ordered its first VU in 1941. In 1945 it ordered a second VU for a different plant. For another of its plants one unit was installed in 1946 and two more in 1947. In 1949 a VU was installed in a fourth plant, and in 1950 one was installed in a fifth plant. A total of seven boilers in five different plants.

A Sugar Company ordered two VU Boilers for one of its plants before the war. In 1946 it ordered a VU for a second plant. And in 1950 another VU was installed in this same plant.

A Steel Company now has a total of fourteen VU Boilers in four different plants. Starting with an installation of two units in the early thirties, it has reordered six times. The most recent installation of two units at one of its plants was completed in 1948.

* * *

This is just a small sample of the hundreds of companies that have ordered and *reordered* the VU Unit. They have found *through their own experience* that the advanced design, sound construction and consistent reliability of the VU Unit mean *lower steam costs*. Once you have a VU in service you soon know why it is that so often *one* VU starts a family. B-494

— SUPERHEATER, INC.

200 MADISON AVENUE, NEW YORK 16, N. Y.

C-E

LOOK TO DOW FOR

Diethyl Malonate

$(CH_3-CH_2-OOC-CH_2-COO-CH_2-CH_3)$

readily available!

Diethyl Malonate is *readily available* at Dow. If you use this important chemical intermediate, order from Dow.

Diethyl Malonate is widely used in the manufacture of barbiturates. And, because it is an excellent "building block", it is used in the syntheses of many chemical intermediates and organic pigments.

You can rely on Dow to supply your Diethyl Malonate requirements.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

PROPERTIES	
A colorless liquid.	
Boiling range at 760 mm. Hg, 5-95%	196-200°C.
Specific gravity at 25/25°C.	1.055
Freezing point	Below −20°C.
Refractive index at 25°	1.412
Flash point	200°F.
Fire Point	205°F.

Send for Experimental Sample

of DIETHYL MALONATE

The Dow Chemical Company
Fine Chemicals Sales
Midland, Michigan

Name _____ Title _____

Company _____

Address _____

City _____ State _____

DOW
CHEMICALS
INDISPENSABLE TO INDUSTRY AND AGRICULTURE

IT ALWAYS PAYS TO SPECIFY

LADISH

Controlled Quality

PIPE FITTINGS

Ⓛ

TO MARK PROGRESS

...you get full value for every fittings dollar

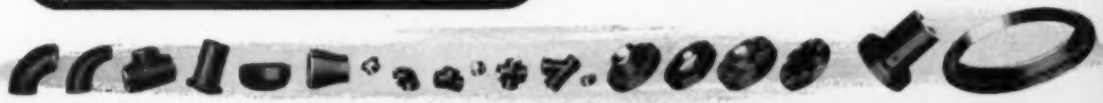
THE COMPLETE *Controlled Quality* FITTINGS LINE
PRODUCED UNDER ONE ROOF...ONE RESPONSIBILITY

LADISH CO.

CUDAHY, WISCONSIN
MILWAUKEE SUBURB

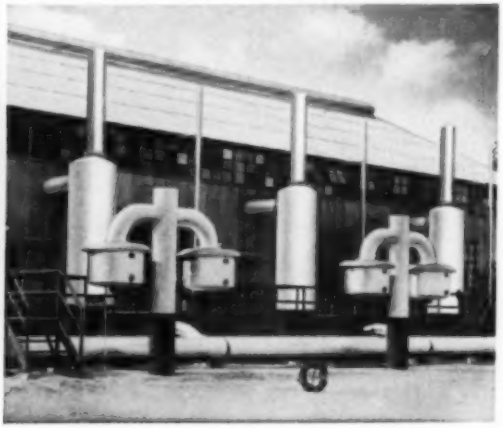
District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland • Chicago • St. Paul
St. Louis • Atlanta • Houston • Tulsa • Los Angeles • Havana • Toronto • Mexico City

The more critically you appraise value... the more you will appreciate Ladish Controlled Quality Fittings. For the ultimate economy of Ladish Fittings is assured by laboratory, engineering and manufacturing controls unsurpassed for thoroughness and rigid standards. From metallurgy through machining ... repeated tests safeguard the extra strength and soundness vital to long dependable service ... extra value you can always depend on from Ladish Controlled Quality Fittings.



Large Compressor Station uses Burgess-Manning Snubbers for *Quiet Operation*

New type Burgess-Manning SDL-20 Side Inlet Exhaust Snubbers on Cooper-Bessemer Model GMW-6 1440 hp gas engine compressors at a Texas natural gas pipe line station.



● The management of this outstanding compressor station called on Burgess-Manning for the installation of their Snubbers to quiet the exhaust roar of huge gas engines. Burgess-Manning, with a quarter century's progressive research work and extensive field experience, has earned an enviable reputation in industry as a leader in engine exhaust and compressor intake noise reduction; and as a specialist in surge control in compressor gas and air line systems. For a solution to these problems, consult with Burgess-Manning.

BURGESS-MANNING COMPANY

749 East Park Avenue, Libertyville, Ill.
1203 Dragon Street, Dallas, Texas

Will Defense Production Be Caught in the Squeeze?

When Congress revised and extended the Defense Production Act, it relaxed a squeeze on business profits.

President Truman asserted that this action by Congress cripples the government in its effort to prevent inflation which, as he puts it, could lead to "enrichment and profiteering for the few, economic hardship and misery for the many."

He asked Congress to rescind its action.

This editorial—the second on problems presented by "escalator"clauses—aims to throw some light on this conflict of opinion.

The Squeeze

The squeeze on profits was imposed in the name of price stabilization. The idea behind it was simple. The *selling prices* of industrial products were to be held under a tight lid. But many industrial costs are affected by "escalator" clauses of one kind or another which tend to boost production *costs*. Thus, with rising costs and fixed prices, profits would be squeezed and much of the cost of defense would thereby be shifted from those favored by escalator clauses to business concerns.

The mechanics of this squeeze on profits were complicated. But here, in brief, is how it was to work. The first step was to require manufacturers to set ceiling prices, effective May 28, for their products.

These ceiling or maximum prices were to allow for increases in manufacturers' costs that had occurred since Korea. *But they did not allow for all increases.* Manufacturers, for example, could not include increases in indirect costs—office or selling costs. Neither could they, in calculating their new prices, include increases in the costs of materials or direct labor that had come after March 15. This was the first phase of the squeeze on profits.

The second phase was prepared by not putting a ceiling on costs. The Wage Stabilization Board said it could not disturb the operation of "escalator" clauses by which wage rates are geared to the cost of living. Moreover, nothing could be done to curb the operation of the farmers' "escalator" clause, the farm parity arrangement. Under it, the federal government underwrites higher prices for farm products to match increases in the cost of things farmers buy. So this left wages and many materials costs free to rise against a ceiling imposed on the prices of what industry has to sell.

Relief—at a Loss

On two conditions only would the Office of Price Stabilization permit a company to raise its prices and escape this squeeze. One of these was that increased costs had more than wiped out its profits; in other words, that it was operating at a loss. The other condition was

that the industry of which the company is a part was not, as a whole, making "excess profits." That is, the industry, as a whole, could not get price relief if its overall profits before taxes were greater than 85 percent of its average profits during the best three of the four years from 1946 through 1949. Many companies expected that their profits would be cut drastically before they could get through this narrow escape hatch.

When this squeeze on profits was set up, we were told that industry as a whole was reporting record profits. But, it was equally true that wage rates and farm prices also were at record high levels. And it was also true that, under the impact of rising taxes and the dislocations caused by the defense mobilization program, profits actually were on the way down.

Profits—Going Down

By the time Congress acted to relax the squeeze, corporate profits, after taxes, were running at a rate 20 percent lower than they had been six months before. And the clear prospect was that they would continue to decline.

So the issue put up to Congress was simply this. Should business firms stand so much of the brunt of the defense costs while "escalator" clauses continued to exempt organized workers and farmers from paying their share of those costs?

But this question actually is much broader than one of fairness or unfairness alone. One certain effect of such a squeeze on profits would be to undercut the capacity of private industry to install the new plants and equipment needed for our mobilization effort. Today—unlike World War II—private industry is financing almost all of our huge program to expand production. And about two-thirds of the money that has been plowed into the expansion and improvement of our industrial machine since World War II has come out of profits.

In view of all this, Congress decided last summer to relax the pressure on profits. This was done by the controversial Capehart Amendment to the Defense Production Act. This amendment has serious administrative weaknesses. But some measure with the same purpose is needed to maintain profits at a high enough level to finance the huge and continuing expansion of our industrial machine that is now underway.

Basic Issues

As soon as the amendment was enacted, the President asked Congress to revise the law again. The heart of his proposal was to restore to the Administration the powers it used last spring to arrange the squeeze on profits outlined here.

This controversy will continue. There can be no final answer to it as long as we have the economic controls made necessary by mobilization.

But if we look beneath the surface of this technically complicated controversy, we shall see clearly that the basic issues are:

1. Whether we really shall make an effort to distribute fairly the burdens of inflation caused by our defense mobilization—

2. Whether farmers and organized workers should be exempted from these sacrifices by escalator clauses—at the expense of the nation as a whole—

3. Whether profits should be squeezed still more—at the risk of putting a fatal squeeze on the effort of industry to build new plants and install new tools. These new facilities are essential to maintaining American living standards—and they are the heart of our ability to defend ourselves and the rest of the free world.

Americans face no more important economic issues at this time.

McGraw-Hill Publishing Company, Inc.

IN LAPP CHEMICAL PORCELAIN

VALVES • PIPE • RASCHIG RINGS

PLUG COCKS • PUMPS • TOWERS AND TOWER PLATES • NOZZLES • TUBES • BRICK AND TILE • POTS JARS • DISHES • AND SPECIAL PORCELAIN SHAPES

THE

CHEMICAL STABILITY

AND DEPENDABLE LONG SERVICE

OF LAPP PORCELAIN

is in the Porcelain Itself

It takes select clays to meet Lapp specifications for plasticity, impurity content, acidity and other important properties. Every carload of clay is laboratory tested at Lapp before use.

Lapp Vacuum Process removes all air, in bubbles and in solution, from liquid clay slip, assures against voids, laminations or blebs.

Two continuous tunnel kilns fire Lapp ware, over a 31½ day heating, soaking and cooling cycle. Temperatures exceeding 2350° F. are precisely controlled to assure complete vitrification.

It takes more than the word "porcelain" to describe a material of the chemical stability, purity, resistance to corrosion, absolute freedom from porosity, cleanability and high mechanical strength . . . of *Lapp Chemical Porcelain.*

NO LIQUID PENETRATES Unlike other so-called "porcelains," Lapp porcelain is completely vitrified . . . a dense, pure, homogeneous body, without blebs or voids. With or without glaze, it is unaffected by all acids except hydrofluoric, relatively resistant to alkalis. It permits accurate grinding and polishing for perfectly finished joints or seating surfaces.

MECHANICALLY TOUGH, LONG-LIVING Non-porosity of Lapp porcelain is the chief factor in its long life. Routine dye tests attempt to force dye into unglazed body at pressure of 100,000 lbs. per square inch, without the slightest trace of penetration even though continued for unlimited time. Glassy-smooth glaze actually imparts extra mechanical strength and heat shock resistance. The body itself is highly resistant to corrosion and abrasion. Being non-porous, no capillary pressures can be built up within. For most applications Lapp Porcelain continues to serve indefinitely with exactly the same efficiency as the day on which it was installed.

Write for Bulletin 244 for complete description and specifications of Lapp Chemical Porcelain. Lapp Insulator Co., Inc., Process Equipment Division, 000 Maple St., LeRoy, N.Y.

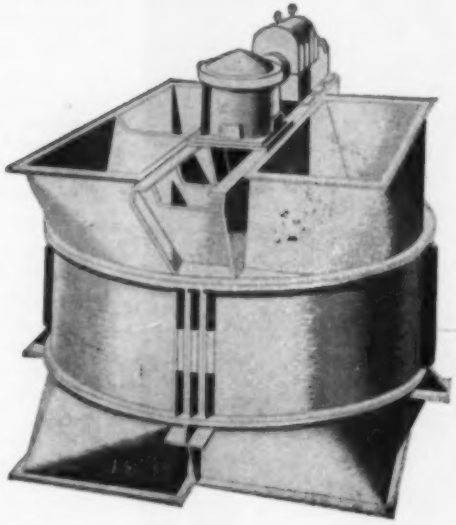
Lapp *Process Equipment*

GET ALL 3 with the LJUNGSTROM AIR PREHEATER

- Improved Combustion
- Better Heat Recovery
- Plant Material Savings

If you want to improve the combustion of low-grade fuels . . . raise the level of heat recovery . . . conserve critical materials in plant design . . . you or your consultants can make profitable use of Preheater experience. Let our specialists tell you more about the Ljungstrom Air Preheater, and the outstanding job it has done for hundreds of America's leading industries and public utilities, where the need for preheated air from 300F to approximately 1200F was part of their problem. Our engineers are ready to work with you in applying the Ljungstrom to your own heat recovery problem.

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.



THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

Up...up...up where the weather is rough!

Houdriflow Catalytic Cracking Unit, Sun Oil Company's Woodville Road Refinery, Toledo, Ohio. Contractor: Catalytic Construction Co., Philadelphia, Pa. "Century" Asbestos Corrugated Sheets erected by Elwin G. Smith & Company, Pittsburgh, Pa., and Toledo, Ohio.

Men and equipment are permanently protected by *"Century"*® Corrugated Asbestos-Cement Sheets

High on the side of this catalytic cracking tower there are no wind breaks . . . no shade . . . nothing to block driving rain and the fury of storm. Yet inside the elevator tower it's always dry . . . always protected . . . always "a nice day." "Century" Corrugated Asbestos-Cement Sheets make a completely weather-tight enclosure—give permanent protection to men and equipment.

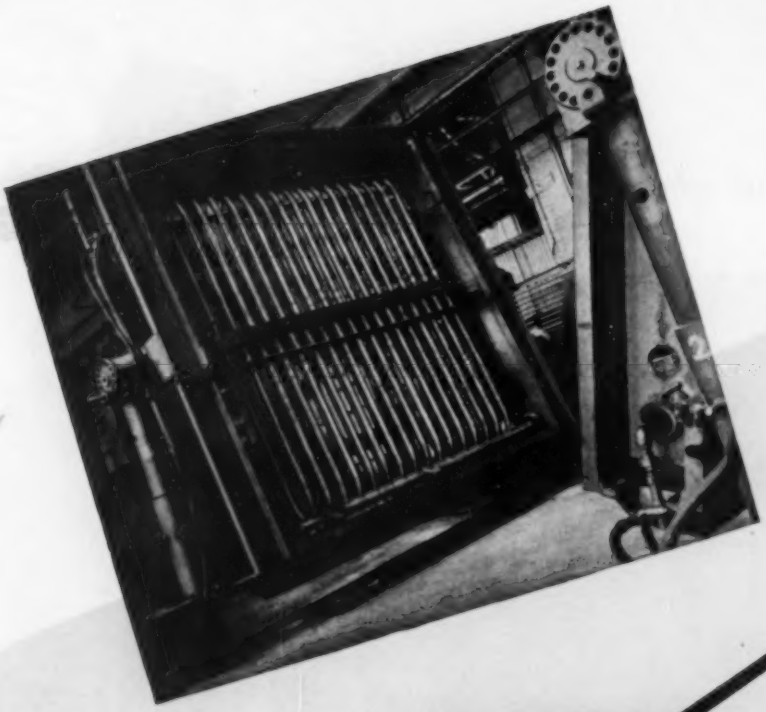
And, despite the fact that the tower is exposed to the elements, maintenance will never be a problem. For in addition to resisting weather, "Century" Asbestos Corrugated *can not burn, rot, or rust*—rodents and termites can't hurt it. It doesn't even need protective painting to preserve it. Consider the maintenance costs these characteristics save!

"Century" Asbestos Corrugated can be applied quickly, easily, inexpensively. The large-size sheets are exceptionally strong, but they can be cut and drilled with ordinary working tools—can be fastened in place with a minimum of labor.

Whatever your building plans—new construction, expansion, or modernization—it will pay you to consider cost-saving "Century" Corrugated Asbestos-Cement Sheets for both siding and roofing. We'll be glad to send complete details on request.

Nature made Asbestos . . .
Keasbey & Mattison
has made it serve mankind since 1873

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA



36 miles

# of tube-fabricating know-how

Some 190,000 feet—over 1370 tons—of 5 to 27 per cent chromium steel tubing were skillfully joined by an entirely new technique of welding to form catalyst cases for dehydrogenation units in a butadiene plant. *All* operations on this record-size high-chrome fabricating job were performed in B&W's own shops. Operating temperatures range from 200 F to 1300 F.

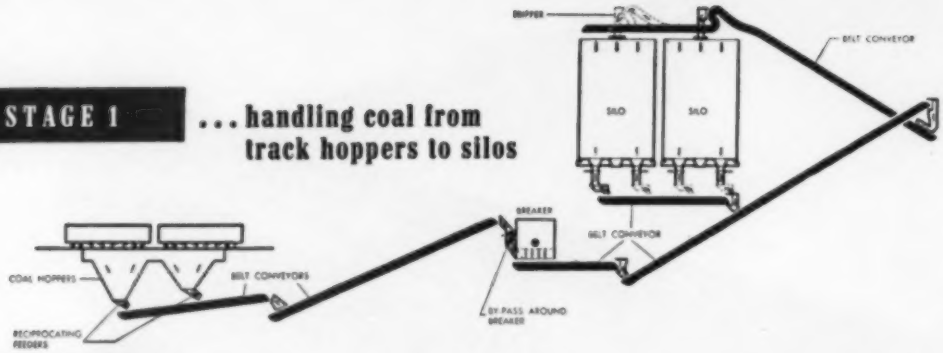
It's this ability to work closely with designers and operators of such advanced process operations that distinguishes B&W from ordinary jobbing fabricators. Years of experience with the full range of industry's process equipment needs . . . joined with unexcelled facilities, ample research equipment and personnel for development work in numerous fields . . . help insure the dependability —and economy—of B&W Products.

BABCOCK & WILCOX

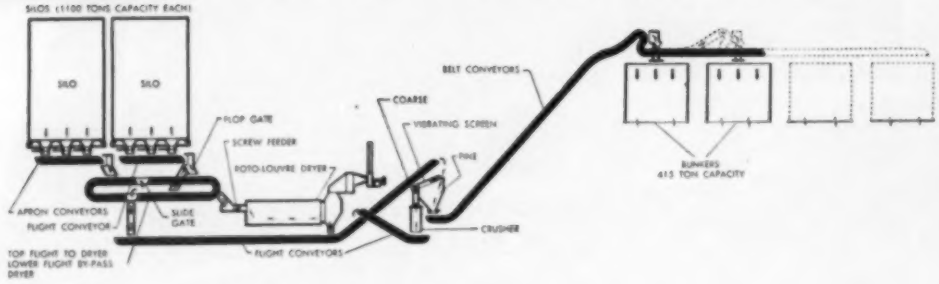
The Babcock & Wilcox Company, 85 Liberty Street, New York 6, N. Y.

S-405T

STAGE 1 . . . handling coal from track hoppers to silos



STAGE 2 . . . handling coal from silos through dryer to bunkers



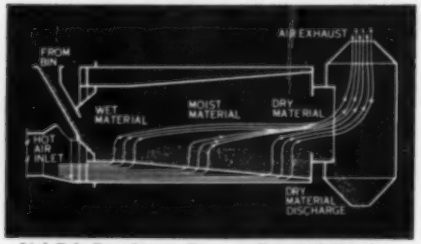
New power plant dries its own coal!

Dow's South Station utilizes wet, low grade bituminous with LINK-BELT equipment

Economical steam generation of power moved a step forward when Dow's new power plant at Midland, Mich., went into operation. By installing a Link-Belt Roto-Louvre Dryer, Dow makes a low grade bituminous easier to handle . . . a better fuel.

And the 14 conveyors and feeders are all Link-Belt—apron, belt, flight and reciprocating types.

You, too, can put Link-Belt's vast coal handling experience to work for you. From our complete line, our engineering staff will help you or your consultants plan for highest efficiency in coal handling.



Link-Belt Roto-Louvre Dryer at Dow is believed to be the first ever installed at a power plant. Longitudinal section shows flow of material and gases.

For trouble-free delivery of coal to storage silos: Link-Belt tank type Tripper and Belt Conveyor with Type "100" Idlers.

LINK-BELT

COAL HANDLING EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12.476

POSEY EQUIPMENT EXPANSION

Backs Posey Delivery Dates

200,000 gallon elevated tank— by Posey Iron.

This 50-ton crane (27-foot headroom) allows quick, easy handling of sizeable units like this butane tank.

Stacks have long been a specialty at the Posey Iron Works.

Expanding production finds Posey ready with a plant recently modernized. Among outstanding equipment units at the Posey Iron Works are the following:

(1) 32 foot roll for bending steel plate.
(2) 16 foot power brake for ¾" steel plate.
(3) 50-ton crane with 27-foot headroom.
(4) 16' 6" vertical boring mill.
(5) Giant lathe — 30' length x 94" diameter.

Posey equipment is housed in plants covering 16½ acres under roof. The right equipment plus adequate plant space — these protect your deliveries at Posey. Write today for free, 12-page reference bulletin.

Posey stainless clad digester —13' O.D. x 40' long.

DIVISIONS:

Brick Machinery . . . Foundry . . . Industrial Heating . . . Iroquois . . . Shipbuilding . . . Steel Plate

POSEY IRON WORKS, INC.

STEEL PLATE DIVISION — LANCASTER, PA.

NEW YORK OFFICE — GRAYBAR BLDG.

Gas Machinery Company

HEAT? Instead of using metal rollers, the manufacturer of this annealing furnace applied a Super Refractory roller-hearth. As a result, the hearth stays straighter, lasts longer, and reduces marking and pick-up.

ABRASION? The skid rails supporting these brass billets were formerly made of alloy. The alloy skids required complete replacement every two to five weeks, constant maintenance between times. When replaced with Super Refractory skids, the new rails required no attention for over three years.

CORROSION? An interesting application of Super Refractories where no heat is involved is this wire guide. It supports newly drawn steel wire as it passes along the bottom of a tank during zinc coating. It seems to be the only material that will stand up at all under the cutting action of the wire and the corrosive action of the plating solution.

CAUGHT for heat

Here's a group of materials often used in place of certain metals—Super Refractories by CARBORUNDUM. Possessing properties seldom associated with refractories, these materials have often proved superior to the metals they replaced; have been invaluable where critical nickel, chrome, or cobalt alloys were involved.

For example, Super Refractories have replaced metals for such diverse applications as: skid rails, muffles, wire guides, radiant tubes, roller hearths, hot blast mains, brazing fixtures, recuperator tubes, etc. In these cases, they not only *released* vitally needed metals but *outperformed* them (by lasting longer than the metals — while also increasing the capacity of the equipment).

As you look over the properties of Super Refractories listed opposite, draw a mental comparison with your needs. Exactly what makes an alloy essential in this place, or that? Is it refractoriness? conductivity? abrasion? corrosion? strength? It's surprising how often you'll find Super Refractories inherently better — and far less expensive — than metals.

It will pay you to investigate these interesting Super Refractories . . . *now*, before the metals cupboard is bare. Won't you write or call us today?

Super Refractories by

CARBORUNDUM

TRADE MARK

Refractories Division — The Carborundum Company, Perth Amboy, N. J.

"Carborundum" is a trademark indicating manufacture by The Carborundum Company

IN THE SQUEEZE resisting metals?

SUPER REFRACTORIES ARE IDEAL WHERE

HIGH HEAT IS INVOLVED. Super Refractories are very strong and durable—can be safely used at temperatures over 3000 F. Compare this with 25-12 chrome-nickel steel, for example, which loses strength rapidly over 1500 F. and cannot be used with safety above approximately 2100 F.

ABRASION OR EROSION ARE PRESENT. Two types of Super Refractories are within one index point of diamond hardness! They are the toughest known materials for large scale commercial use. They will distinctly outwear metals—especially at furnace temperatures.

HEAT CONDUCTIVITY IS NEEDED. At elevated temperatures, one Super Refractory material conducts heat *almost as rapidly as chrome-nickel steels*. It's widely used in equipment involving heat transfer. There are also Super Refractories which are good insulators, particularly at high heats.

STRENGTH IS IMPORTANT. Super Refractories are generally very strong, and *retain* their strength at temperatures where metals become unusable. For example, the modulus of rupture of one composition averages 3100 psi, at 2460 F. No commercial tonnage refractories have greater strength.

CHEMICAL ACTION IS PRESENT. In general, most Super Refractories are either neutral or acid in nature—are widely used where chemical inertness is important.

SPECIAL SHAPES ARE INDICATED. Practically all Super Refractories are available in a wide variety of construction shapes molded to close tolerances—including fitted joints, tubes, etc.

USE THIS BOOKLET TO CHECK UP. This new booklet contains an easy-to-read analysis of the principal characteristics of these unique Super Refractories. The coupon will bring you the story—or one of our engineers will be happy to talk over your problems. We believe it could be mutually profitable.

Dept. P-101
Refractories Div., The Carborundum Co.
Perth Amboy, New Jersey

Please send me your free booklet on the properties of Super Refractories.

Name_____

Position_____

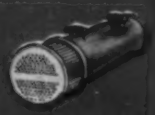
Company_____

Street_____

City_____ Zone____ State_____

ALCOA

Alcoa Heat Exchanger News



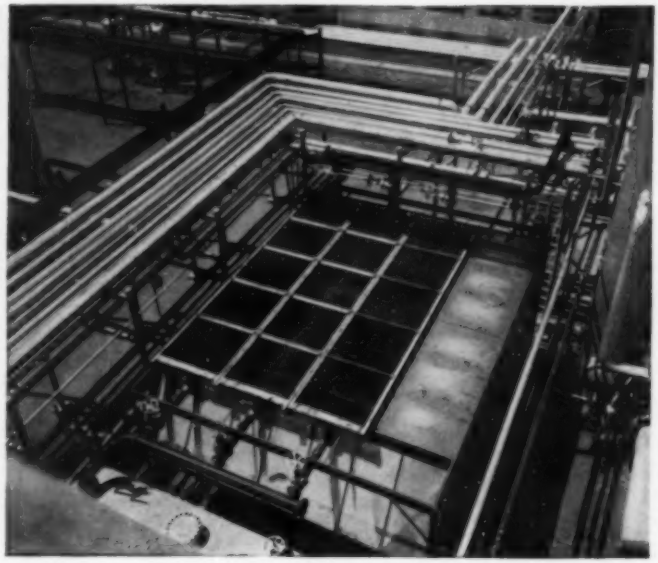
Published by Aluminum Company of America

Rearmament needs severely limit the manufacture of aluminum heat exchanger tubes. But we realize that the purchase of refinery and processing equipment requires long study of economic and performance factors. That is the reason for this message.

Skelly Oil Company Saves 50%

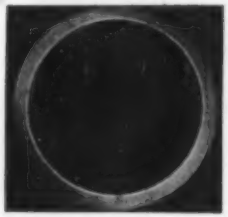
IN TUBE COSTS ON AIR COOLED EXCHANGERS

At their Eunice No. 2 gasoline plant near Eunice, New Mexico, Skelly Oil Company has installed a "Fin-Fan" air-cooled unit equipped with "aluminum tubes" and "aluminum fins" as a condenser for "Still Overhead Vapors." The company's engineers chose this type of condensing equipment because the atmosphere contained hydrogen sulfide and the vapors contained hydrogen sulfide and water in corrosive quantities. In addition there was a shortage of suitable cooling water. Aluminum tubes and fins were preferred to steel or Admiralty tubes with copper fins because of their resistance to hydrogen sulfide corrosion and lower investment cost. In this particular installation Fluor Fin-Fan designed equipment with Griscom-Russell K finned aluminum tube sections was used. The aluminum tubes are rolled into cast-iron headers and no cathodic protection has been necessary. These units have been in service for over two years—show no sign of corrosion—should last 12 to 15 years based on past experience with aluminum.



ALCLAD TUBES . . .

a bargain in cooling water corrosion resistance



HOW THEY WORK

The thin zinc-aluminum alloy internal layer galvanically resists corrosion of the base aluminum alloy structure of the tube—acts like a "built-in" anode. Corrosion is confined within the integral cladding layer. Even when large areas of the Alclad coating have been destroyed by electrolysis, the rest of the coating still protects the exposed alloy core. Alclad Tubes have withstood such corrosive attack for more than 17 years.

WHAT THEY COST

Foot for foot, metal for metal, Alclad Tubes cost less than any other tubes except bare aluminum. 20% less than ordinary steel. 47% less than Admiralty brass. 83% less than stainless steel.

ALCOA OFFERS BOOKLET

This 24-page booklet will answer many of your questions about Alcoa Tubes. It covers fabrication techniques, alloy selection, chemical and petroleum applications. It describes tube cleaning, inhibitors, cathodic protection. It contains complete information on fluid flow and heat transfer. There are formulas, tables and specification data. Write for your free copy today. ALUMINUM COMPANY OF AMERICA, 1860K Gulf Building, Pittsburgh 19, Pennsylvania.

Instrument NEWS

ETHYL CORPORATION CUTS TEL TEST TIME WITH G-E X-RAY PHOTOMETER

General Electric's X-Ray Photometer has enabled Ethyl Corporation, Yonkers, N. Y. to cut time and expense in determining the tetraethyl lead (TEL) content of gasoline.

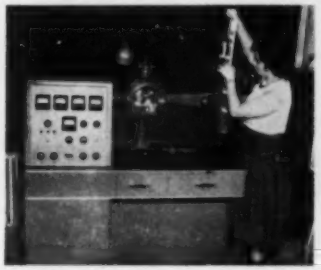
Previous standard methods of analysis require three hours to complete, including 20 minutes of operator time; whereas the G-E X-Ray Photometer requires only 15 minutes for the entire test.

The rapid analysis possible with the X-Ray Photometer has enabled closer control and has freed the chemist from routine work. Sturdy shielding and interlocks provide adequate protection for the operator. The General Electric X-Ray Photometer has maintained high accuracy of results, and the test is non-destructive in nature.

Operator inserts test coil in X-Ray Photometer at Ethyl Corporation, Yonkers, New York.

NAVAL RESEARCH LABORATORY STUDIES SURFACES WITH G-E ELECTRON DIFFRACTION INSTRUMENT

The U.S. Naval Research Laboratory, Washington, D.C., finds a wide variety of experimental applications for the G-E Electron Diffraction Instrument. In operation for approximately two years, the instrument enables the Laboratory to conduct studies and experiments on all types of surfaces.

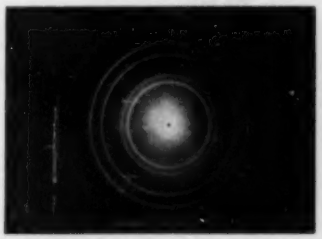


Electron Diffraction Instrument installed at U. S. Naval Research Laboratory, Washington, D. C. Operator shown loading camera in preparation for sample study. (Official United States Navy Photograph.)

With the General Electric Electron Diffraction Instrument, surface studies of corrosion, and organic film adsorption are made, leading to the development of new materials by the Lubrication Branch of the Chemistry Division. This is one of the units used at the Naval Research Laboratory at this time (left).

A leading feature of the instrument is its large specimen chamber. This makes it unnecessary to cut up specimens. Testing is non-destructive and valuable samples are preserved. The unit enables the study of systems at various stages of the experiments.

Great versatility is achieved by variable beam voltage, which can be adjusted to a maximum of 50,000 volts. The Naval Research Laboratory finds it advantageous to operate at 35,000 volts, for their work.



Typical diffraction pattern of an aluminum sample often used to calibrate the Electron Diffraction Instrument.

ESSO INSTALLS A G-E MASS SPECTROMETER

At the Esso Research Center, Linden, N. J., the G-E mass spectrometer has proven valuable in the solution of difficult analytical problems arising in connection with petroleum processes, products and derivatives. Advantage is taken of its high resolving power in the analysis of a wide variety of materials. Direct recording is a very useful feature.

DEWPOINT RECORDER CHECKS MOISTURE FOR CHRYSLER AIRTEMP

Better moisture control of air used for drying refrigerator coils, has been achieved with a G-E Dewpoint Recorder, installed at Chrysler Airtemp Division, Chrysler Corporation, Dayton, Ohio.

Large dehydrating equipment supplies dry air for this operation. With the Dewpoint Recorder, a continuous check and permanent record is kept of the moisture content of the air before it enters the coils, resulting in savings in material and labor.

The G-E device replaced a test which was slow and used large amounts of CO_2.

GENERAL ELECTRIC

General Electric Co., Section C 687-81, Schenectady, N. Y.

(√) Indicate for reference only.
(X) For planning an immediate project

Please send me the following bulletins:

- ☐ GEC-412A—X-Ray Photometer
- ☐ GEC-587—Mass Spectrometer
- ☐ GEC-588—Dewpoint Recorder
- ☐ GEC-656—Electron Diffraction Instrument

Name.....
Address.....
Company.....
City..... State.....

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

Turbines

Turbo Generators

Ignitron Rectifiers

A. C. Motors

Gear Motors

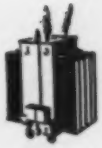
Speed Reducers

Corrosion Resisting Motor Control

Circuit Breakers for Hazardous Locations

Disconnecting Switches

Instruments



Power Transformers

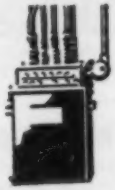
Distribution Transformers and Switchgear

Capacitors

Industrial Lighting

Electronic Tubes

Oil Immersed Pushbuttons



Oil Immersed Panelboards

WESTINGHOUSE

Westinghouse

Unit Responsibility

CUTS CHEMICAL POWER COSTS

The manufacturer of your steam and electrical equipment plays a vital role in providing the most efficient power system for your chemical processes. In serving you, that manufacturer should be capable of:

1. Providing the complete line of power equipment your process may require.
2. Furnishing you co-ordinated engineering and supervision of installation.
3. Giving you the benefit of years of experience in the application of power equipment in the Chemical Industry.

These elements of unit responsibility add up to a reduction in costs. You get them all from Westinghouse.

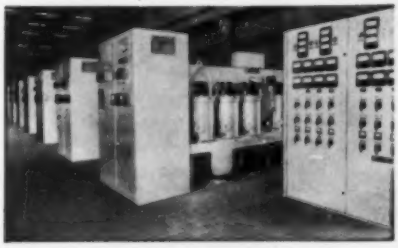
Generation: Westinghouse gives you the complete installation for producing power, plus help in working out your electrical and steam requirements for the most efficient possible plant balance.

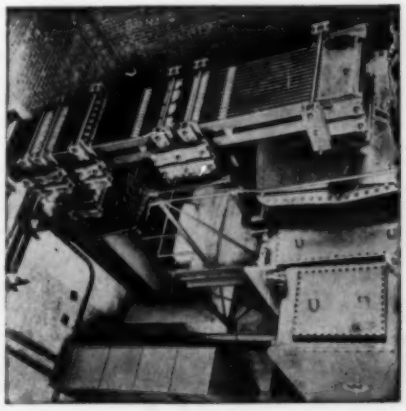
Distribution: Westinghouse makes a correlated line of distribution apparatus, ranging from the smallest arrester to the world's largest substation. All indoor and outdoor enclosures are Bonderized to resist corrosion, and outdoor switchgear is additionally protected by all-weather undersurface coating.

Utilization: Westinghouse makes a full line of mechanical drive turbines and chemical motors, ranging from small, explosion-proof, fan-cooled, Life-Line motors to the largest explosion-resisting, inert-gas-filled, squirrel-cage type motors ever built. A complete line of Westinghouse control, including corrosion-proof or explosion-proof types where needed, is also available to meet the rigid requirements of chemical plant service.

Give us an opportunity to assume this unit responsibility and help you find the solution to your chemical power problems. Call your nearest Westinghouse office, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-94804

(Below) Westinghouse Ignitron Rectifiers provide large blocks of rectified power. They carry heavy loads continuously, at full capacity, with safety and at low maintenance cost. ***(Right)*** Without this 40,000-ampere-series resonance furnace circuit, developed by Westinghouse, the power factor would have been 30%. In this chemical plant installation, use of the series transformer reduced installation cost and raised power factor to unity.





PUTTING *Air* TO WORK FOR ALCOA

Axiflo® Fans develop ample pressure to perform efficiently in duct systems and discharge against strong winds.

In Elbow Axiflo Fans, motors, belts and bearings are located outside the air stream, an advantage in handling corrosive fumes.

Silentvane® Centrifugal General Purpose Fans move air efficiently and quietly for many industrial and commercial applications.

BIG BREEZE

SOAKS UP 300° IN A HURRY

These 100-foot strips of structural aluminum are getting an air bath that sponges off 300° F. . . . but fast. A concentrated blast of air quenches the hot shapes leaving the forming mold . . . cools continuously for over 100 feet as they move down the line.

Mounted overhead are 17 Sturtevant Axial Flow Fans, delivering quenching air that helps maintain mechanical properties in the aluminum through quick, even cooling. These large capacity fans supply a steady stream of cooling air at high efficiency. Result: a uniform product for ALCOA.

There's Westinghouse equipment ready to help you *put air to work* too . . . whether it's with air handling, air conditioning, or electronic air cleaning. Call your local Westinghouse-Sturtevant office for full details, or write Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Massachusetts.

YOU CAN BE SURE...IF IT'S

Westinghouse

J-80226

DREW FATTY ACIDS
are distilled – fractionated!

CHEMICAL DATA

PRODUCT	TYPE	FFA	TITRE °C	IODINE VALUE	ACID VALUE	SAP. VALUE	COLOR
AB	Distilled-Fractionated Coconut Fatty Acid	126-132	24-28	8-16	250.6-262.5	250.6-262.5	20.0/3.0
AAB	85-90% Lauric Acid	139-144	37.0 Min.	3.0 Max.	277-286.4	277-286.4	15.0/2.0
ABL	70% Lauric Acid	138-141	30.0 Min.	5.0 Max.	274.4-280.4	274.4-280.4	20.0/3.0
ABH	Distilled Fractionated Hydrogenated Coconut Fatty Acid	126-132	29	3.0 Max.	250.6-262.5	250.6-262.5	15.0/2.0
AAAR	Distilled Coconut Fatty Acids	123-128	20.0 Max.	16-22	245-255	245-255	35.0/5.0
Caprylic Acid	Caprylic Acid—65% Caprylic Acid—80%	104 101		2.0 Max.	366 380	366 380	10.0/2.0
Wecoline S	Double Distilled Soya Fatty Acid	99-102	22-24	125-140	196.9-203	196.9-203	10.0/1.5
Wecoline S-2	Distilled Soya Fatty Acid	99-107	24-28	105-125	196.9-212.8	196.9-212.8	35.0/10.0
Wecoline L	Double Distilled Linseed Fatty Acid	99-101	22.0 Max.	175-192	196.9-200.8	196.9-200.8	10.0/1.5
Wecoline C	Cottonseed Fatty Acids	98-103	34-38	96-110	196-206	196-206	30.0/8.0
Wecoline OD	Double Distilled Oleic Fatty Acid	98-101	8.0-10.0	85-93	194.9-200.8	194.9-200.8	10.0/1.5

In addition to being distilled, Drew Fatty Acids are also fractionated by a continuous process. This selective process reduces unsaponifiables, color and odor forming bodies to a minimum . . . separates and concentrates unsaturated acids . . . stabilizes the selected fractions. You buy and pay *only* for the fractions that are *best* for your products.

Fractionation is but one of the *extra* values in Drew Fatty Acids. Proper selection and treatment of raw materials prior to distillation are a *must*, for top quality. That is why you can depend on consistent, uniform quality for your products. You *know* that regardless of the quantity you order—or when—you'll get the same unvarying high quality every time.

Make your products *better*—specify Drew Fatty Acids. Write for reference booklet, "Drew Fatty Acids" today.

Distilled and Fractionated Fatty Acids:

COCONUT LAURIC STEARIC OLEIC SOYA CAPRIC CAPRYLIC
LINSEED COTTONSEED SAFFLOWER MIXED VEGETABLE

TECHNICAL PRODUCTS DIVISION

E. F. DREW & CO., INC.

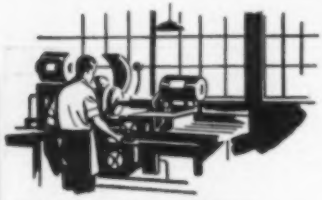
15 EAST 26th STREET, NEW YORK 10, N. Y.

CHICAGO PHILADELPHIA BOSTON

DREW PRODUCTS

American Blower...a time-honored name in air handling

Charlotte, N. C., has a conveniently located American Blower Branch Office to provide you with data and equipment for air handling. You can reach American Blower in Charlotte by calling 3-8444. In other cities, consult your phone book.

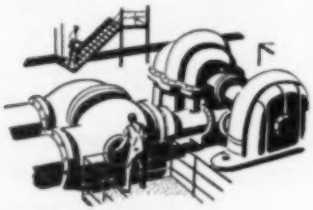


FOR MILLING, GRINDING...

Dust from grinding machine operations created a problem in the plant of a major steel file manufacturer. Then, several American Blower Type E Industrial Fans were installed. Now, the plant is cleaner, safer, and working conditions more pleasant. Type E Fans are specially designed to remove shavings, sawdust, dust from grinding and buffing, to convey material, remove smoke and fumes, and for many other applications. Can American Blower products help you?

MORE EFFICIENT POWER...

American Blower Induced Draft Fans play an essential part in the operation of a new military air station power plant. High static efficiency, low RPM, low tip speed and low inlet velocity are important operating characteristics of these dependable fans. In military or civilian installations, American Blower equipment meets the most exacting power plant requirements. If you are enlarging or expanding your facilities, consult us.



BETTER PUMPING...

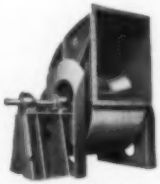
A large midwestern city recently invested in an American Blower Gyrol Fluid Drive for one of its municipal water supply pumps. After two months the average power requirements dropped from 932 kilowatt hours per million gallons of water to 718 kilowatt hours—a reduction of 23%. After the first year the increased power savings and added flexibility of control justified the addition of a second fluid drive on a larger unit. Could *you* save with Gyrol Fluid Drives?

If you're faced with changing from civilian to military production, let American Blower supply you with the air handling products that improve comfort and efficiency in business: For full data on American Blower heating, cooling, drying, air conditioning and air handling equipment, phone or write our nearest branch office.

Unit Heaters

Ventura Fans

Air Conditioning Equipment



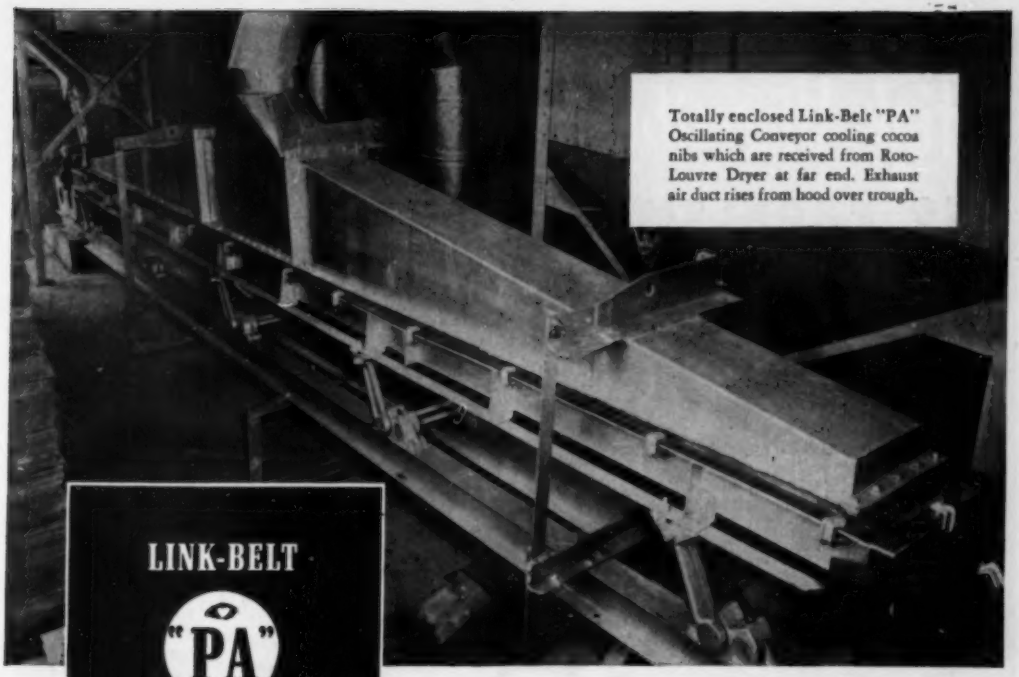
Industrial Fans

Utility Sets

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

YOUR BEST BUY AMERICAN BLOWER AIR HANDLING EQUIPMENT

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TORRINGTON



Totally enclosed Link-Belt "PA" Oscillating Conveyor cooling cocoa nibs which are received from Roto-Louvre Dryer at far end. Exhaust air duct rises from hood over trough.

LINK-BELT

"PA"

Oscillating Conveyor

handles conveying jobs never before practicable

Advanced engineering pays off in increased production . . . reduced handling costs

Here's the biggest advance in materials handling in years — Link-Belt's "PA" Oscillating Conveyor. "PA" stands for positive action—action that moves large volumes of material so gently that even a cigarette ash can travel the entire run intact.

But that's only part of the story! "PA" Oscillators are compact—a "natural" for passing congested locations. More—they're leak-proof—can be totally enclosed for dust- or gas-tight service. For other applications, they've been steam- and water-jacketed . . . even louvered. Field tested—hundreds of successful installations.

As for versatility — you can install dividers to handle more than one material at a time without mixing . . . discharge at any desired points. Maintenance, too, is lower—no joints in trough, no return runs to require attention—low operating frequency.

If you have a handling trouble spot, Link-Belt's "PA" Oscillator may be the answer. Book 2244 gives full information.

CHECK THESE 9 CONVEYING ADVANCES

1. "PA" POSITIVE ACTION—uniform flow, regardless of surges. Spring action reduces forces — minimum horsepower.
2. LEAK-PROOF — can be made dust- or gas-tight.
3. SANITARY — completely self-cleaning.
4. COMPACT — requires opening only slightly larger than trough.
5. LONG LIFE—all-metal, few moving parts.
6. LOW MAINTENANCE — only drive is lubricated.
7. GENTLE—no breaking down of material.
8. VERSATILE—for a few pounds or 200 tons per hour.
9. ECONOMICAL — particularly for longer runs.

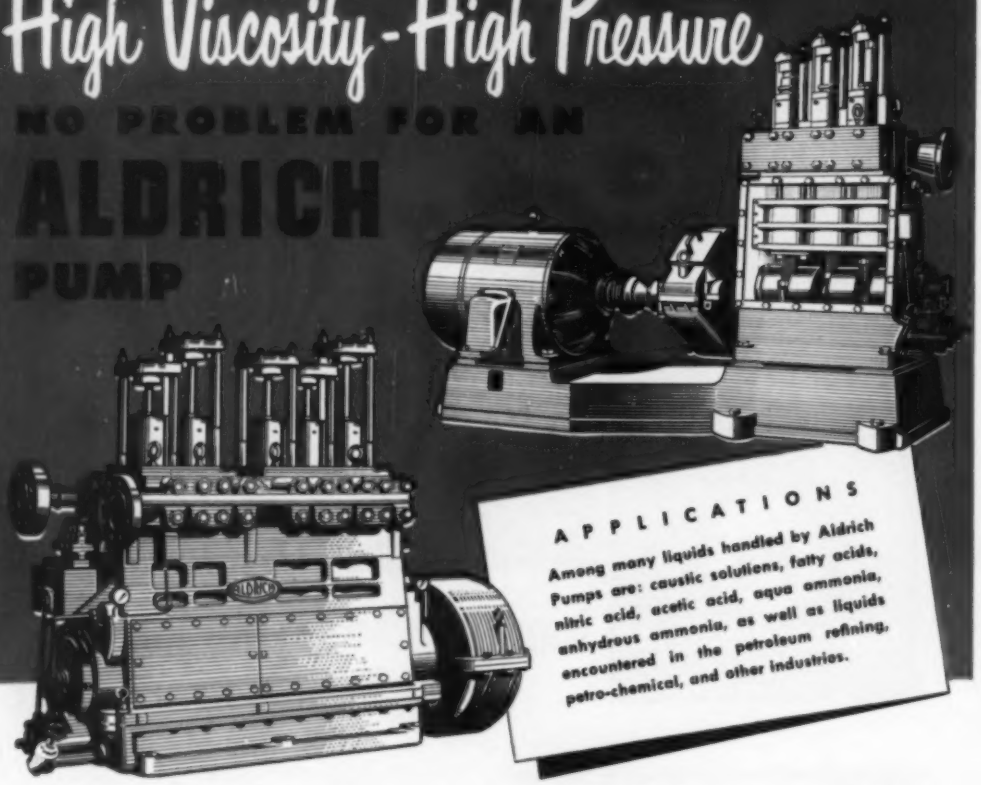
LINK-BELT

"PA" OSCILLATING CONVEYORS

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12,412

High Viscosity - High Pressure

NO PROBLEM FOR AN ALDRICH PUMP



APPLICATIONS

Among many liquids handled by Aldrich Pumps are: caustic solutions, fatty acids, nitric acid, acetic acid, aqua ammonia, anhydrous ammonia, as well as liquids encountered in the petroleum refining, petro-chemical, and other industries.

Aldrich Direct Flow Triplex and Quintuplex Pumps

From our service files we can frequently make specific recommendations to meet your chemical pumping needs . . . whether they involve corrosion, high viscosity or high pressure.

Many of your requirements can be met by an Aldrich *Direct Flow* Pump . . . a unit featuring advantages such as: high volumetric efficiency; sectionalized fluid-end; interchangeable wearing parts (among 3-, 5-, 7-, and 9-plunger pumps); changeable plunger sizes, and higher operating speeds which result in more work from a *smaller, more compact* pump.

Aldrich Direct Flow Pumps are made in 3", 5" and 6" stroke sizes. They range up to 900 hp, 7500 psi. To regulate capacity, units can be furnished with an Aldrich automatic by-pass valve control system which operates with all types of accumulators. Write for Data Sheet 64 Series.

THE ALDRICH PUMP COMPANY

...Originators of the Direct Flow Pump

3 GORDON STREET • ALLENTOWN, PENNSYLVANIA

Representatives: Birmingham • Bolivar, N. Y. • Boston • Buffalo • Chicago • Cincinnati • Cleveland • Denver • Detroit
Duluth • Houston • Jacksonville • Los Angeles • New York • Omaha • Philadelphia • Pittsburgh • Portland, Ore.
Richmond, Va. • St. Louis • San Francisco • Seattle • Spokane, Wash. • Syracuse • Tulsa • Export Dept.: 751 Drexel Building, Phila. 6 Pa.

Warm up before the game

An old duffer we know told us that. He'd say, "Ever notice how much better you do on the back nine? That's because you've warmed up on the front nine. So get smart and warm up before the game!"

That's why we're asking you right now to start thinking of the advantages of buying your caustic soda from Wyandotte. . . . Even though we've got little to sell you, unless you're a customer of record.

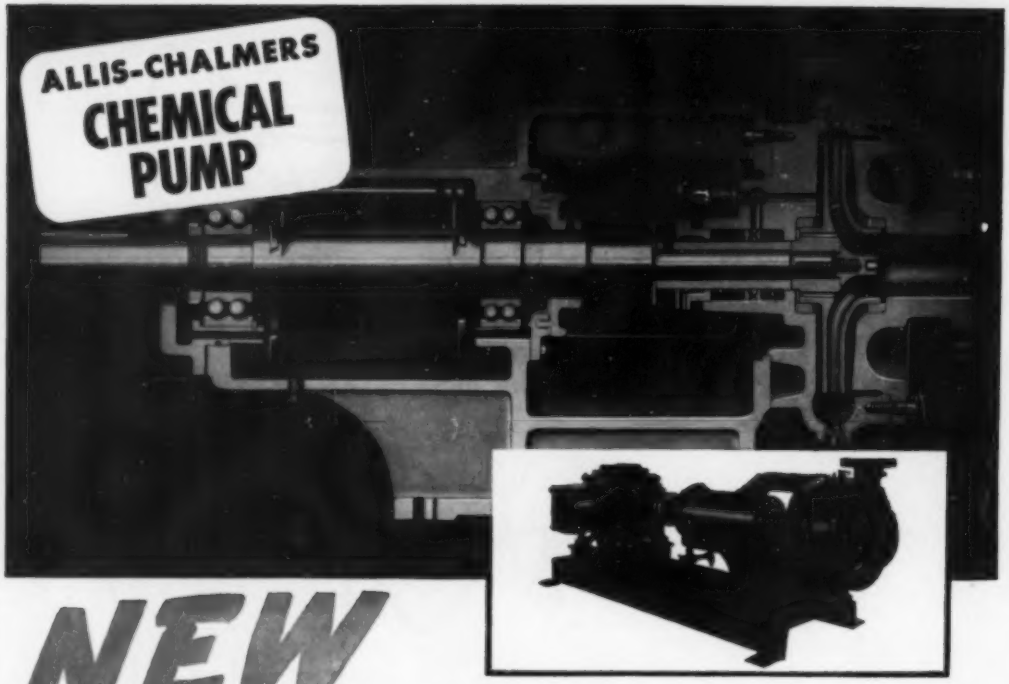
Come to think of it, that's a pretty good reason to figure on doing future business with us. Because we're a source you can depend on.

SODA ASH • CAUSTIC SODA • BICARBONATE OF SODA
CALCIUM CARBONATE • CALCIUM CHLORIDE • CHLORINE
HYDROGEN • DRY ICE • SYNTHETIC DETERGENTS • GLYCOLS
CARBOSE (Sodium CMC) • ETHYLENE DICHLORIDE • PROPYLENE
DICHLORIDE • AROMATIC SULFONIC ACID DERIVATIVES
OTHER ORGANIC AND INORGANIC CHEMICALS

WYANDOTTE CHEMICALS CORPORATION
Wyandotte, Michigan • *Offices in Principal Cities*

Wyandotte
REG. U. S. PAT. OFF.

ALLIS-CHALMERS
CHEMICAL
PUMP



NEW

Specially Designed for Processing Operations

★ Choice of Materials
★ Oil Lubricated Bearings
★ Temperatures to 500° F.
★ Sizes to 1200 GPM, 250 Ft Head
★ Stuffing Box or Mechanical Seal

LONG LIFE, high efficiency, easy maintenance; you get them all from this new Allis-Chalmers Chemical Pump. A wide choice of materials plus application engineering by men who know how to select the right material for your job means longest possible parts life and low maintenance costs no matter what you pump.

There is plenty of room between pump and pedestal for easy maintenance but rigidity has not been sacrificed. Maximum interchangeability of parts between sizes keeps parts inventory low.

ONE DEPENDABLE SOURCE

Allis-Chalmers can supply you with a complete pumping unit—pump, motor, drive and control — all of coordinated design and manufacture and all mounted on a rigid base ready to install.

To get more information on this new Allis-Chalmers Chemical Pump, call your Allis-Chalmers Authorized Distributor or District Office. Or write to Allis-Chalmers, Milwaukee 1, Wis. for Bulletin 52B7638.

A-3405

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

ALLIS-CHALMERS

Dependable Measurement

is assured with HAGAN

RING BALANCE METERS

COST DISTRIBUTION is easy when the sum of individual flows equals the total flow —and records and totalized flows *are dependable* when made by Hagan Ring Balance Meters.

STANDARD ASSEMBLIES are available for measuring flow differentials up to 420″ water column at 3000 psig.

DUAL METER ASSEMBLIES give two records of flow differentials, each up to 140″ water column at 3000 psig.

AUTOMATIC COMPENSATION for pressure or temperature, or both, may be added.

For more information about Hagan Ring Balance Meters, clip the coupon.

FEATURES OF ALL HAGAN RING BALANCE METERS INCLUDE:

- ★ No Stuffing Boxes
- ★ Mercury level not critical
- ★ Dead-weight calibration under full static pressure
- ★ Full scale differential range adjustable over 7-to-1.

HAGAN CORPORATION

RING BALANCE FLOW AND PRESSURE INSTRUMENTS
THRUSTAR FORCE MEASURING DEVICES
BOILER COMBUSTION CONTROL SYSTEMS
METALLURGICAL FURNACE CONTROL SYSTEMS

Hagan Corporation
Hagan Building
Pittsburgh 30, Pennsylvania

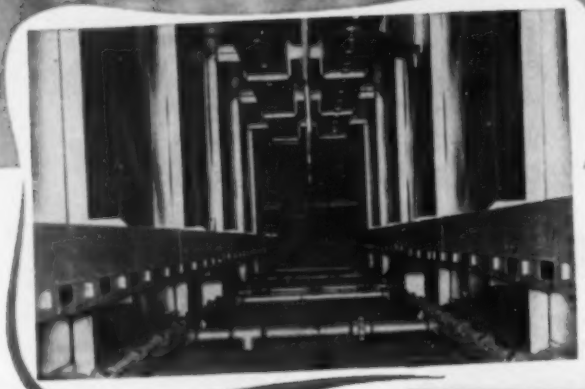
Please send me further information on Hagan Ring Balance Meters. I am particularly interested in.....

NAME.....
POSITION.....
COMPANY.....
STREET AND NUMBER.....
CITY..... ZONE..... STATE.....

CE-10

DEAN SPECIALTY WORKS INC., SAN ANTONIO, TEXAS

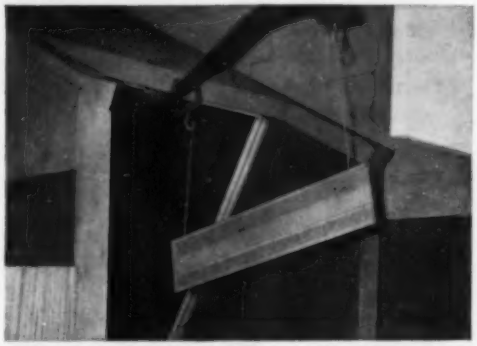
relies on GAS fired infra-red Paint Drying Oven for Metal Parts



27 Gas-fired ceramic burners on each side of 60-ft. long infra-red oven provide controlled temperatures of 100 to 600° F. Metal parts for processing are suspended from overhead track.

THE production line of Dean Specialty Works, Inc., San Antonio, Texas, features a 60-foot Gas-fired infra-red drying and enamel baking oven. Known as an A-Type single pass paint drying oven, this Gas oven utilizes ceramic burners which yield the infra-red rays to dry wet-coated metal parts.

These clay burners, manufactured by Burdett Mfg. Co., Chicago, generate temperatures of 100-600° F., depending on baking cycle, pigments used, and color desired. Former baking methods used required more heat, and the enamel surfaces tended toward brittleness. With this modern Gas-fired infra-red equipment, heat is applied from the inside out, producing a coating which is virtually a part of the metal part.



Suspended part is discharged from the Gas-fired infra-red oven.

Gas Is The Industrial Fuel because

- ★ **Gas is readily controlled to give exact temperatures**
- ★ **Gas is versatile in application**
- ★ **Gas equipment is easily integrated into your production line.**

You can get the facts and figures on Gas-fired equipment for your processes today, by contacting your local Gas Company Representative.

AMERICAN GAS ASSOCIATION • 420 LEXINGTON AVENUE • NEW YORK 17, NEW YORK

YEARS MORE LOW-COST LIFE

with

ELECTRUNITE HEAT EXCHANGER TUBES

Increase the years between retubings . . . cut the per-hour cost of exchanger operation . . . specify ELECTRUNITE Pressure Tubes for new equipment . . . and for all your retubing jobs.

Fully-normalized structure provides uniform ductility for fast, smooth roll-in of ELECTRUNITE Tubes. Cold forming gives them clean, scale-free surfaces that assure maximum service life. Choose from a wide range of sizes and grades, in carbon steel and stainless steel analyses. For complete data and information, write to

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION
224 EAST 131st STREET • CLEVELAND 8, OHIO

REPUBLIC STEEL

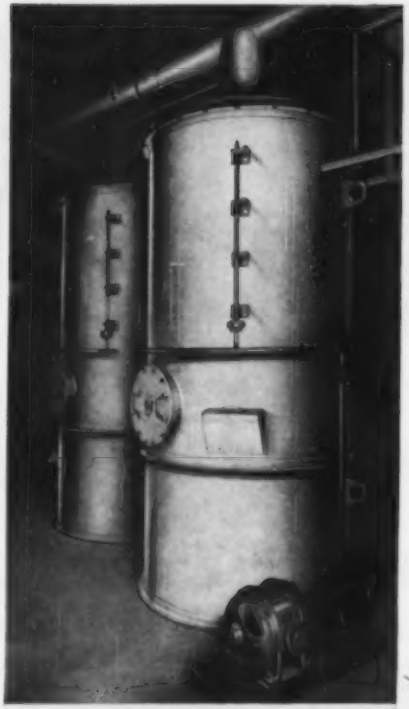
Republic

ELECTRUNITE

BOILER, CONDENSER AND HEAT EXCHANGER TUBES

DUST and FUME Control

Special equipment engineered to solve individual problems posed by dusts of all kinds, fly ash, chemical fumes, gases of any temperature, aerosols, and other troublesome air polluents



MAHON FOG-FILTERS AT WORK

The installation illustrated above was specially designed for the Motor State Oil & Grease Co., Jackson, Mich. PROBLEM: To eliminate H_2S odor from sulphonated grease manufacturing operations. The problem was complicated by grease and oil fumes present in H_2S gas. SOLUTION: A two-tower Fog-Filter connected in series was designed with high pressure water fog collecting practically all of the grease and oil fumes in the first tower. A caustic solution employed in the second tower and fogged at lower pressure removes the remaining H_2S from the air before it is exhausted into the atmosphere.

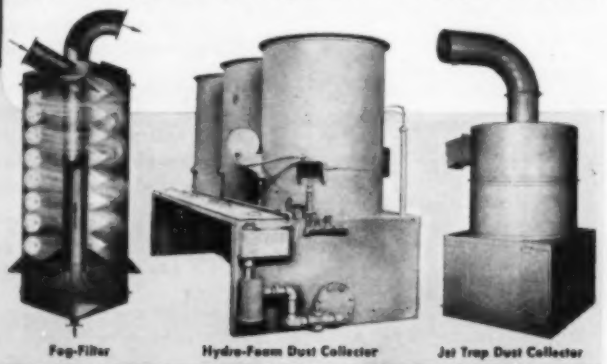
In dealing with air contaminants, each individual air cleaning problem must be approached with a view to determining what type of collector or filter is required to produce maximum results under existing conditions. Study and analysis of the character and extent of the polluent is therefore imperative in arriving at a satisfactory solution. Mahon dust and fume control engineers have, over a period of years, developed and perfected special Wet and Dry Collectors and Fog-Filters which have proved highly successful in coping with all types of industrial air contaminants—a few are illustrated here . . . they are serving today in some of the most difficult and mandatory air cleaning jobs in industry. Each installation has been engineered to do the specific job. If you have an air pollution problem, regardless of its character, it will pay you to call in a Mahon engineer and let him show you what Mahon equipment has done with like polluents under conditions comparable to your own. See Mahon's Insert in Sweet's Mechanical Industries File for further information, or write for Industrial Equipment Catalog A-652.

THE R. C. MAHON COMPANY

Main Plant and Home Office, Detroit 34, Michigan

Engineers and Manufacturers of Dust and Fume Control Equipment Including Cyclone Collectors, Hydro-Foam Collectors, Jet Trap Collectors, Hydro-Filter Collectors, and Fog-Filters and Cupola Stack Washers.

All Mahon Equipment is Erected by Mahon to Insure Complete Satisfaction.



Fog-Filter **Hydro-Foam Dust Collector** **Jet Trap Dust Collector**

MAHON

How can you expand a Nation with Baking Soda!

Military demands have made civilian and soldier interdependent, inseparable. Yet a man may well wonder how he contributes to expanding our national strength at this time of mobilization, if he spends his whole day making baking soda. Bicarbonate of soda is one of the major products, by tonnage, of DIAMOND ALKALI and the men who make it never know how much will go into baking cookies for civilian delight or into charging fire extinguishers for civilian defense.

Every chemical DIAMOND makes is used in both civilian and military goods. Bicarbonate of soda can become whatever men want it to become, food for Korean orphans or an aid in processing military leather. The determining factor is man's purpose which, after all, is a matter of man's desire. That's the most hopeful thing about present-day expansion of the chemical industry—it can all be diverted to wiping out war's causes, to helping create world-wide abundance, by a mere change of heart.

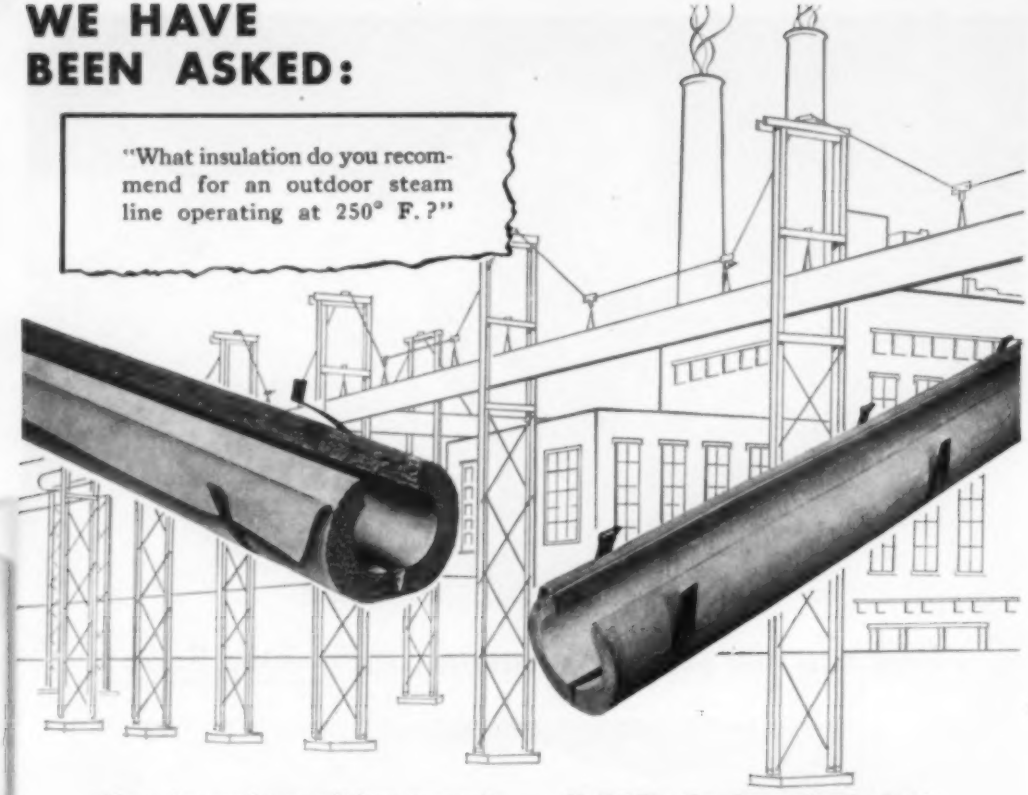
DIAMOND ALKALI CHEMICALS

Chemicals you live by... **DIAMOND ALKALI COMPANY** CLEVELAND, OHIO

SODA ASH • CAUSTIC SODA • CHLORINE & DERIVATIVES • BICARBONATE OF SODA • SILICATES • CALCIUM COMPOUNDS • CHROME COMPOUNDS • ALKALI SPECIALTIES

WE HAVE BEEN ASKED:

"What insulation do you recommend for an outdoor steam line operating at 250° F.?"



"In a few months, we will have some outdoor steam lines installed in our plant," writes a power plant engineer. "Operating temperature will be 250° F.—pressure, 15 lbs. We plan to use Air Cell Pipe Covering but wanted to check this with you before we went ahead with the job. Is this the insulation that you would recommend?"

Chances are that the writer based his choice of insulation only on the fact that operating temperature would be 250° F. Air Cell is often the recommended insulation for temperatures up to 300° F. In this case, however, the outdoor location makes 85% Magnesia a much sounder investment.

85% Magnesia gives outstanding service under rugged outdoor conditions. If weatherproofing felt over the pipe covering breaks or loosens and water seeps through, the heat of the line dries out the Magnesia and restores its original efficiency. The covering does not shrink or deteriorate.

Air Cell Pipe Covering, on the other hand, is an efficient, low-cost insulation that gives good service on indoor applications where it isn't subjected to severe conditions of dampness, bumping, or abrasion.

This question points up an important part of every insulation job; double-checking your choice of insulation *before* you put it up. Trained engineers in a near-by Armstrong office will be glad to go over the specifications for any job you may be contemplating. They can also give you details on the quality materials and expert installation service offered by Armstrong's contracting organization.

SEND US YOUR QUESTIONS: If you have any questions on the use or application of either high- or low-temperature insulation, please do not hesitate to write to us. We'll do our best to give you a practical answer. Just address a letter or card to Armstrong Cork Co., 3310 Maple Avenue, Lancaster, Penna.

ARMSTRONG'S INDUSTRIAL INSULATIONS

MATERIALS - INSTALLATION

FOR ALL TEMPERATURES FROM 300°F. BELOW ZERO TO 2800°F.

Traylor
ROTARY COOLERS

Three types

SOLVE COOLING PROBLEMS

Air—Combination Air and Water—Water

When the "heat's on" for more production . . .

. . . of calcined materials such as Lime, Alumina, Magnesia and many chemicals . . . it's wise to recheck the efficiency of cooling equipment. Obsolete, inefficient coolers throttle production . . . throw the whole calcining process off balance.

A cooler "Traylor-made" for its job has no production equal. One of the 3 types of Traylor Coolers will solve most any cooling problem. To make sure of *performance* beforehand . . . get a cooler "Traylor-made" to fit your needs exactly.

Traylor

Rotary Kilns, Coolers and Dryers . Grinding Mills
Jaw, Reduction and Gyratory Crushers . Crushing Rolls
Apron and Grizzley Feeders

TRAYLOR ENGINEERING & MANUFACTURING CO.
393 MILL ST., ALLENTOWN, PA.

Mail coupon today
for more complete information on Traylor Rotary Coolers.

Name _____

Company _____

Address _____

_____

SALES OFFICES: New York, N.Y.; Chicago, Ill.; Los Angeles, Calif.
CANADIAN MFRS: Canadian Vickers, Ltd., Montreal, P.Q.

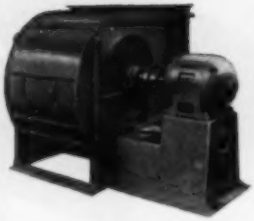
A "TRAYLOR" LEADS TO GREATER PROFITS

LIMIT-LOAD FANS

For large-scale ventilation. Quiet, non-overloading. Sizes up to 500,000 c.f.m. Bulletin 3675.

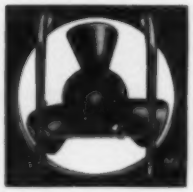
AXIAL FLOW FANS

For light-duty ventilation and air conditioning service. Compact, non-overloading. Bulletin 3533-C.



POWER PLANT FANS

Primary, forced draft, induced draft — built for the severest service. Bulletin 3750.



BREEZO FANS

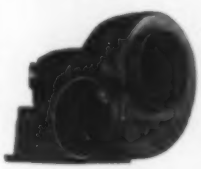
Easy-to-install wall fans. Durable and very economical. 6 sizes. Bulletin 3222-F.

TYPE "CB" PRESSURE BLOWERS

For single-stage pressure blowing up to 2½ pounds per square inch. Bulletin 3553-A.

TYPE "CC" PRESSURE BLOWERS

In sizes for pressures up to 4 pounds and capacities up to 75,000 c.f.m. Bulletin 3553-A.



BABY CONOIDAL FANS

Compact, for portable or duct-connected service. Quiet, efficient. Bulletin 5499.

"Buffalo" BUILDS THE *RIGHT* FAN FOR THE JOB

Whether you need to ventilate a small room or an entire factory — clean tools with air or give your boiler system the most efficient mechanical draft — "Buffalo" builds the fan for the job! And whatever "Buffalo" fan you pick, you can know that its performance is backed by 73 years of "air know-how". Take a look at the fans shown here, and write us for engineering bulletins by number on any that might fit your particular application!

BUFFALO FORGE COMPANY

501 MORTIMER STREET, BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Branch Offices in all Principal Cities

—And For PUMPS . . .

. . . you'll find a rugged precision-built "Buffalo" Centrifugal Pump of the right design, the right metal or alloy and right capacity to handle your liquid-moving job most efficiently. WRITE FOR FACTS!

BUFFALO PUMPS, INC.

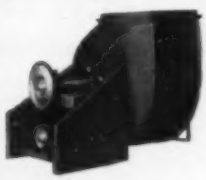
501 MORTIMER STREET, BUFFALO, NEW YORK

Canada Pumps, Ltd., Kitchener, Ont.

Branch Offices in all Principal Cities

VOLUME FANS

For blowing or exhausting, up to 10" s.p. 8 discharge positions. Bulletin 5615-A.



BELTED VENT SETS

Compact, "package" fans for duct or free-air delivery. Non-overloading. Bulletin 5720.

"RE" BLOWERS—EXHAUSTERS

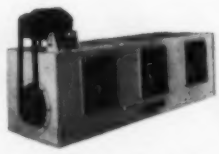
Larger versions of "Buffalo" "E" Blowers, in sizes from 50 to 1600 c.f.m., for pressures up to 40" of water.

INDUSTRIAL EXHAUSTERS

With interchangeable wheels for air exhausting or materials conveying. All-welded. Bulletin 3576.

"E" BLOWERS—EXHAUSTERS

For oil or gas furnace blowing, line boosting, cleaning. Bulletin 3014-C.



SHORTBOY VENTILATING SETS

New high efficiency all-aluminum blowers with hollow shaft. Bulletin 3701.

BELT-AIR FANS

Efficient, quiet wall fans for free-air delivery up to 19,000 c.f.m. Bulletin 3222-F.

Just off the Press!

NEW Variac BULLETIN — Write for Your Copy

New models . . . more detailed electrical and mechanical specifications . . . complete table of all standard single, ganged and polyphase VARIACS are described in this profusely illustrated, complete VARIAC Bulletin, now ready for mailing. We know you'll want a copy. Fill in and mail the coupon below.

GENERAL RADIO Company

275 Massachusetts Avenue, Cambridge 39, Mass.

90 West St. NEW YORK 6

[illegible] S. Michigan Ave. CHICAGO 5

1000 N. Seward St. LOS ANGELES 38

SEND ME THE NEW VARIAC BULLETIN

Name _____

Street _____

City _____ *Zone* _____ *State* _____

Baker Platinum Laboratory Ware

Production of platinum laboratory ware has been a specialty of ours for almost three-quarters of a century, and we have devoted a great deal of research and experiment to improving it.

This work has been aided greatly by the fact that we maintain and operate large scientific laboratories and use our own platinum ware in them.

Thus, the ware is subjected to day in, day out tests through use, and practical experience has brought about a number of improvements, among which are:

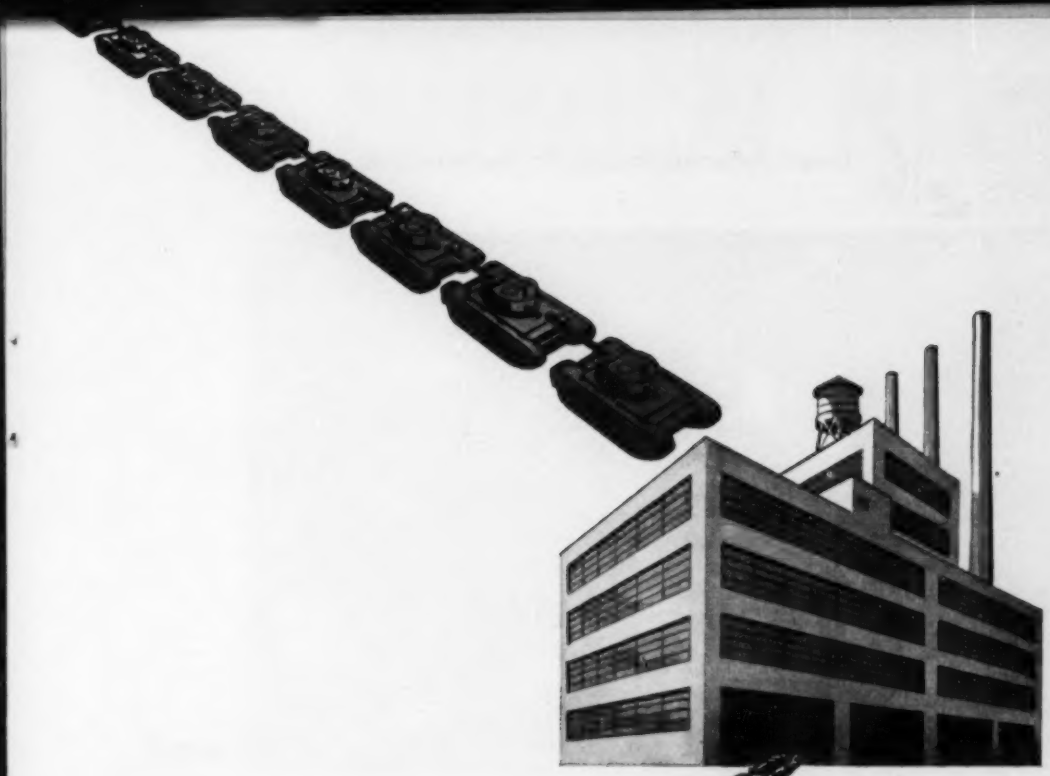
Improvements in metallurgical processes which have increased its useful life — development of the platinum-rhodium alloy which is now so widely used — design changes like the reinforced rim on crucibles and dishes — development of the low form crucible — improvements in the design of platinum electrodes.

You run no risk in making Baker Platinum Laboratory Ware standard equipment.

BAKER & CO., INC.

113 Astor St., Newark 5, N. J.

NEW YORK **SAN FRANCISCO** **CHICAGO**



This supply line is geared for your stepped-up production

AMERICA REARMS. This rearmament program undoubtedly means that your plant has, or will have, a greatly stepped-up production schedule. And with new machines and new operations, new lubrication problems are created.

That's where we come in. A Standard service-supply center is near your plant. Any petroleum product you need can be delivered to your door within a few short hours. You need never worry about production delays, and you can avoid the expense of stocking large supplies of lubricants and fuels within your plant.

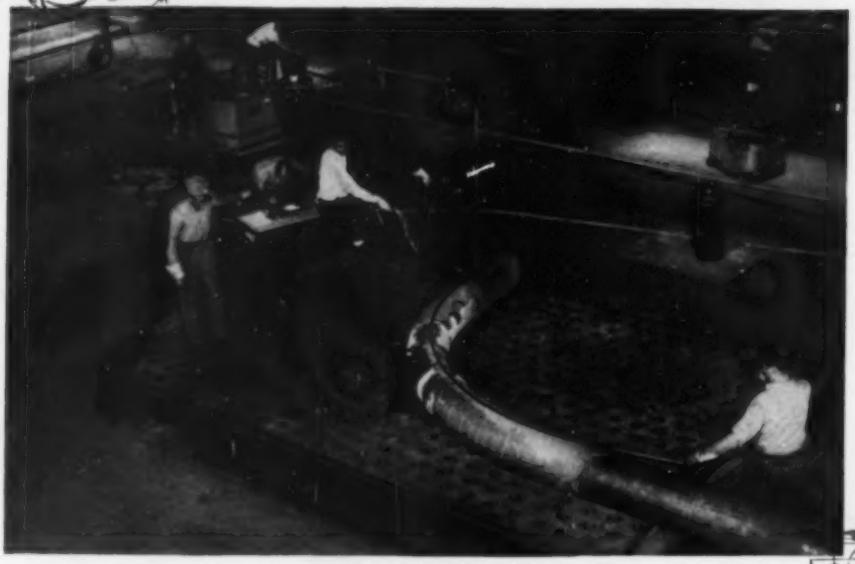
Your nearby Standard service-supply center is your always-dependable Supply Line. It is also headquarters for a Standard lubrication specialist, a man specially trained to give you expert and thorough advice on any lubricating problem, is also available through this service-supply center. His services, along with Standard Oil's efficient supply service, can help your important production go like clockwork.

To arrange for a visit from your nearest lubrication specialist, phone your nearby Standard Oil service-supply center or write to: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA)

STANDARD

From interpretation to installation . . .



GRINNELL PREFABRICATED PIPING

assures greater customer satisfaction through its five-point program of

Quality Control

The bending operation illustrated above is an example of Grinnell QUALITY CONTROL *in action* . . .

The tubing shown is made from a chromium alloy steel forging, turned and bored. Outside diameter is 14¾ inches; wall thickness 2⅜ inches. Temperatures of the tubing within the bending furnace were maintained and controlled within 20°F of specified temperatures. Bending was done with such skill and rapidity as to permit a temperature drop of only 100°F at the inside surface of the tubing. Maximum thinning was only .06 inch.

Designed for a central station power plant to accommodate 1500 PSI and 1050°F, this is typical of Grinnell's engineering knowledge which assures prefabricated piping of the right kind — for all types of installations no matter how complex.

QUALITY CONTROL is the result of Grinnell's 100 years of practical experience in the field of piping. Delivery of prefabricated piping subassemblies to exacting engineering requirements which meet all governing code requirements is assured by Grinnell Quality Control, which includes:

- Interpretative engineering
- Metallurgical research
- Specialized facilities
- Skilled personnel
- Rigid inspection

ECONOMY of specifying Grinnell prefabricating piping results from:

- One source for design, interpretation and fabrication
- Coordination of shop production under ideal conditions
- Elimination of waste by paying only for finished material delivered
- Reduction in field erection time

Write for the booklet, Grinnell Prefabricated Piping.

GRINNELL

WHENEVER PIPING IS INVOLVED

GRINNELL COMPANY, INC., Providence, R. I. Warehouses: Atlanta • Billings • Buffalo • Charlotte • Chicago Cleveland • Cranston • Fresno • Kansas City • Houston • Long Beach • Los Angeles • Milwaukee • Minneapolis • New York Oakland • Philadelphia • Pocatello • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

ADVERTISEMENT—*This entire page is a paid advertisement* *Prepared by U. S. Industrial Chemicals Co.*

U.S.I. CHEMICAL NEWS

October ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1951

Water-Repellent Aerogels Dry Without Shrinking

Production of improved aerogels which have all the properties of dried gels made with present methods, but with the added advantage of water-repellency, is claimed possible with a new process recently patented in Canada.

Aerogels are valuable in removing undesirable compounds from lubricants, refining sugar, purifying gases, absorbing vapors, dehumidifying air, and as carriers for contact catalysts. Up to this time, however, they have suffered from effects of water and humidity, with the result that they shrink on drying out.

High Volume to Weight Ratio

The new aerogels are said to have an extremely high volume to weight ratio, to be highly resistant to moisture, and to overcome successfully the problem of shrinkage on drying. The materials are reported to be useful as fillers for heat insulation and as additives for greases, anticaking agents, printing inks, paints, varnishes, and lacquers. Silica aerogels are incombustible and are said to be suitable substitutes for kapok in life preservers.

Non-Aqueous Titrations Simplify Control Analyses

Non-ionic titration in solvents other than water is described as a promising new analytical tool, the possibilities of which have only been touched upon as yet. Present techniques include a method for titrating an oxazoline in glacial acetic acid with perchloric acid in acetic acid as titrant, replacing a lengthy Kjeldahl procedure formerly used for the determination. Another method can be used to titrate halides, nitrates, sulfates, and phosphates of amines, heterocyclic bases, and quaternary ammonium compounds—including such physiologically active compounds as vitamins, antihistamines, and alkaloids, it is said.

Enthusiastic analysts claim that non-aqueous titrations reduce markedly the cost of running many routine determinations. Less expensive and less complicated equipment is needed, and precision and accuracy are said to be good, all of which are primary requirements of product control laboratories.

Brain Chemical May Cause High Blood Pressure

A recently discovered chemical which is secreted by the brain and passed directly into the blood stream is thought to be a possible factor in causing high blood pressure. The chemical has not been completely identified as yet but is said to resemble serotonin, a substance found in clotted blood. Indications of the chemical's action were obtained when blood pressures of volunteer patients were lowered markedly on administration of hydrazinophthalazene, a drug known to counteract the new compound. The chemical is a possible explanation of why mental stress and anxiety can raise blood pressure, it is said, because mental tension causes an increase in the brain's secretion of the substance.

U.S.I. to Exhibit Products At Three Trade Shows

Will Have Displays at American Vocational Assn. Convention And Georgia State Fair — Complete New Exhibit Booth Being Readied for Paint Industries Show in November

Products of U. S. Industrial Chemicals Co. Division of National Distillers Products Corporation will be exhibited at two conventions and a state fair this fall, company officials announced recently. A U.S.I. exhibit featuring Pyrenone* Grain Protectant — illustrating the grains it protects, the types of storage facilities in which it is effective, and how farmers should apply it — will be on display at the 96th annual Georgia State Fair, to be held this year October 15 through 20 at Macon, Georgia. About 125,000 farmers and members of such groups as Future Farmers of America and 4-H clubs attend the fair each year.

Pyrenone Grain Protectant exhibit to be displayed at American Vocational Association Convention and Georgia State Fair.

Response to the introduction of Pyrenone Grain Protectant has been especially enthusiastic in the South, where insect infestations are severe because of the warm climate. U.S.I. plans to have continuous showings of the new sound movie "Wicked Willie Weevil" at the booth, since it dramatizes the Southern farmers' insect control problem.

Vocational Group Has Large Agricultural Membership

The Pyrenone Grain Protectant exhibit will also be displayed at the American Vocational Association Convention to be held at

MORE

Separate Aromatics Using New Silica Gel Process

A method for commercially separating aromatics by means of silica gel is expected soon to add an annual 13 million gallons of benzene, 30 million gallons of toluene, and 15 million gallons of xylenes to the country's production of these critically needed materials.

Developed from a technique used in petroleum analysis, the process consists of passing an aromatic-rich stream from a catalytic reforming process through a bed of silica gel which retains the aromatics and allows the saturate portion to pass through. When absorption capacity of the gel is reached, the feed is shut off and the bed desorbed, first with a stream of mixed xylenes which washes out residual charge stock, then with a stream of butane which gradually displaces the absorbed aromatics. A light sulfuric acid treatment and final fractionation is reported to produce specification products.

Article Abstracts Apply Statistical Engineering To Chemical Industries

Abstracts of articles on statistical engineering as applied to chemical process industries such as food, refining, pulp and paper, and rubber, are compiled in a single 48-page booklet just published. Statistical engineering is the application of theories of statistical mathematics to experimental processes in order to arrive at most efficient and least costly operation from the standpoint of objectives and results. According to the booklet, statistical methodology has been relatively neglected in chemical experimentation as compared to its use in other fields.

Glycerine-Zirconium Oxide Seen as Poison Ivy Remedy

Poison ivy sufferers will be interested in a new vanishing-cream type of ointment which is reported to have shown highly satisfactory results in medical tests. Containing zirconium oxide and glycerine as principal active ingredients, the ointment is claimed to have cleared up promptly 40 of 47 clinical cases of ivy poisoning treated. In tests on volunteers who were exposed to poison ivy extract, results indicated that the ointment may act as a preventive for poisoning as well as a cure.

Explosion-Proof Glass

A super-laminated plate glass window, developed to minimize effects of explosive forces and to eliminate dangers of flying glass, is reported to have performed successfully in tests involving blasts greater than that of a Hiroshima-type A-bomb at a distance of one mile. Outer layer of the laminate is glass, the middle one is a partially segmented sheet of polyvinyl butyral plastic, the edges of which are bolted to the window frame. The inner layer consists of four triangular pieces of glass held in place by the plastic. When the outer layer is broken by the blast, the plastic layer and inner glass segments swing inward and can later be returned to original position. The plastic's unusual flexibility and resistance to rupture is said to prevent the glass segments from being torn away from the window frame by the impact of the explosion.

ADVERTISEMENT—*This entire page is a paid advertisement* *Prepared by U. S. Industrial Chemicals Co.*

October ★ **U.S.I. CHEMICAL NEWS** ★ 1951

CONTINUED

Trade Show Exhibits

Minneapolis, Minnesota, November 26 through December 1. At the present time, about half of the A.V.A.'s membership is made up of agricultural personnel, and a high percentage of these who will attend the convention are people who teach and deal with rural youth and adults. This A.V.A. agricultural group,

Artist's conception of the new U.S.I. trade-show exhibit booth that will be unveiled at the Paint Industries' Show. Theme of the new booth is "Keep Posted on New Developments—Keep Your Eye on U.S.I."

who have tremendous influence on today's farmers and future farmers, will have a chance at the convention to get first hand knowledge about U.S.I.'s important new Pyrenone Grain Protectant.

Design New U.S.I. Exhibit for Paint Industries' Show

A completely new U.S.I. trade-show exhibit is under construction now and will be unveiled at the Paint Industries' Show at the Haddon Hall, Atlantic City, New Jersey from October 31 through November 3. Held in conjunction with the annual meeting of the Federation of Paint and Varnish Production Clubs and the National Paint, Varnish and Lacquer Association, this show brings together the members of the protective coatings industry and the raw materials and equipment manufacturers who supply that industry.

Theme of the new U.S.I. booth will be "Keep Posted on New Developments—Keep Your Eye on U.S.I." U.S.I. resins, alcohols, and solvents used in the protective coatings industry will be on display, with samples and literature available.

**Reg. U.S. Pat. Off.*

New Washer Eliminates Bottle-Washing Bottleneck

"Dishwashing" problems, a perennial headache for laboratory management, are reportedly solved with a new automatic glassware washer recently introduced to the market. Designed with problems of both service and industrial laboratories in mind, the washer is said to handle six large baskets of laboratory ware at once—bottles, funnels, tubes, flasks, pipettes, Petri dishes, and microscope slides—and to deliver them thoroughly washed and rinsed, chemically clean in a fraction of the time required by conventional methods.

Baskets and holders are available separately for various types of ware. In operation, the proper baskets are loaded and fitted on a drum which rotates ferris-wheel fashion at 9 r.p.m. in and out of a cleaning solution. By means of jets located at one end of the tank, glassware can be given hot and cold rinses as desired, and, in the steam-heated model, can be treated with live steam as well. In action, the washer is said to require only a few minutes of the operator's time, thus releasing him for other duties.

Radioactive Phosphorus Measures Tire Wear

Radioactive phosphorus is reported to be the tool with which scientists are able, for the first time, to measure accurately the wear of rubber tire treads. The isotope, obtained from Oak Ridge, is incorporated in the compounds forming the top layer of tread material of special test tires. A portable Geiger counter, mounted on a small cart behind the wheel, scans the track made by the radioactive tire as it proceeds on the road surface. X-ray photographs of the track allow precise measurement of the size and amount of rubber particles worn off, and a scoop and filter arrangement back of the tire collect for measurement the particles that are blown into the air.

This method is said to have the advantages of giving instantaneous data and of enabling the evaluation of such factors as the type of road surface and temperature, speed, tire pressure, and transmission of power on tread wear.

TECHNICAL DEVELOPMENTS

Information about manufacturers of these items may be obtained by writing U.S.I.

Rapid surface tension measurements, accurate within 5 per cent, are said to be obtainable by even inexperienced workers with a new meter which can be used with all types of solutions except those containing free fluorine ions. **(No. 729)**

Improved rubberized paper is said to result from a new method for adding rubber latex to pulp. Product reportedly has high wet strength and good chemical resistance, and to be suitable for gaskets, multi-wall bags, and box-paper. **(No. 730)**

A new vinyl light stabilizer reputedly withstands 6,000 Weather-Ometer hours compared with the 1,000-hour maximum for most other formulations. The stabilizer is designed for use in sheeting for raincoats, draperies, shower curtains. **(No. 731)**

A synthetic resin cement that sets hard in contact with concrete and metals, is said to join brick and tile and to adhere glass, concrete, metal, and other materials. Resistance to many acids, solvents, greases, and oxidizing agents is claimed. **(No. 732)**

A plastic substitute for decorative metal is being offered for use in radio cabinets, name plates, signs, etc. The material has a mirror-like metallic appearance, is easily laminated to heavy board, and takes silk screening and other reproducing processes, it is claimed. **(No. 733)**

A leak-indicating machine is designed to test steel drums and other types of sealed containers before they are filled with oil or chemical products. According to the maker, the machine is low priced and can be installed by an inexperienced maintenance man in a few minutes. **(No. 734)**

An anti-rust paint which can be applied over rust without scraping or wire-brushing is claimed to be equally effective in preventing rust on new metal and in stopping rust action on already corroded metal. Available in black and in a clear finish which can be painted over with any standard paint. **(No. 735)**

A new synthetic rubber flooring for industrial applications is reputed to dry to a pleasing light concrete color and to bond inseparably, without preliminary treatment, with wood, metal, concrete, brick, slate, stone, asphalt mastic, composition, and other bases. Good resistance to loads of considerable weight is also claimed. **(No. 736)**

A rust-preventive paper wrapping, designed to protect heavy machinery and bulky metal parts during storage and shipping, is described as being tough, resilient, tear-resistant, and moisture- and water-repellent. Product consists of two kraft sheets cemented together and reinforced with spun glass fibers. The inner sheet is impregnated with a volatile rust-inhibitor. **(No. 737)**

A new all-purpose cleaner, said to combine the advantages of an all-vegetable oil soap with those of a synthetic detergent and an alkaline polysulfate, is formulated for efficient action in hard as well as soft water, either hot or cold. **(No. 738)**

PRODUCTS OF U.S.I.

ALCOHOLS
Amyl Alcohol (Isoamyl Alcohol)
Butanol (Normal-Butyl Alcohol)
Fusel Oil—Refined
Propanol (Normal-Propyl Alcohol)
Ethanol (Ethyl Alcohol)
Specially Denatured—all regular and anhydrous formulas
Completely Denatured—all regular and anhydrous formulas
Pure—190 proof U.S.P., Absolute—200 Proof
Solox*—proprietary solvent—regular and anhydrous

ANTI-FREEZE
Super Pyro* Anti-Freeze
U.S.I. Permanent Anti-Freeze

ANSOLS
Ansol* M
Ansol* PR

ACETIC ESTERS
Amyl Acetate—Commercial and High Test
Butyl Acetate
Ethyl Acetate—all grades
Normal-Propyl Acetate

OXALIC ESTERS
Dibutyl Oxalate
Diethyl Oxalate

PHTHALIC ESTERS
Dimethyl Phthalate
Dibutyl Phthalate
Diethyl Phthalate

OTHER ESTERS
Diatol*
Diethyl Carbonate
Ethyl Chloroformate

INTERMEDIATES
Acetoacetanilide
Acetoacet-ortho-chloroanilide
Acetoacet-ortho-toluidide
Acetoacet-para-chloroanilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
Ethyl Sodium Oxalacetate

ETHERS
Ethyl Ether, U.S.P.
Ethyl Ether, Absolute—A.C.S.

ACETONE — A.C.S.

FEED PRODUCTS
Carbay B-Q*
DL-Methionine
Riboflavin Concentrates
Special Liquid Carbay*
U.S.I. Vitamin B_{12} and Antibiotic Feed Supplements
Vacetone* 40

RESINS (Synthetic and Natural)
Arochem*—modified types
Arofene*—pure phenolics
Aroflat—for special flat finishes
Aroplaz*—alkyds and allied materials
Congo Gums—raw, fused and esterified
Ester Gums—all types
Natural Resins—all standard grades

INSECTICIDE MATERIALS
CPR Concentrates: Liquid & Dust
Piperonyl Butoxide
Piperonyl Cyclonene
Pyrenone* Concentrates: Liquid & Dust
Pyrethrum Products: Liquid & Dust
Rotenone Products: Liquid & Dust

INSECTIFUGE MATERIALS
Indalone*
Triple-Mix Repellents

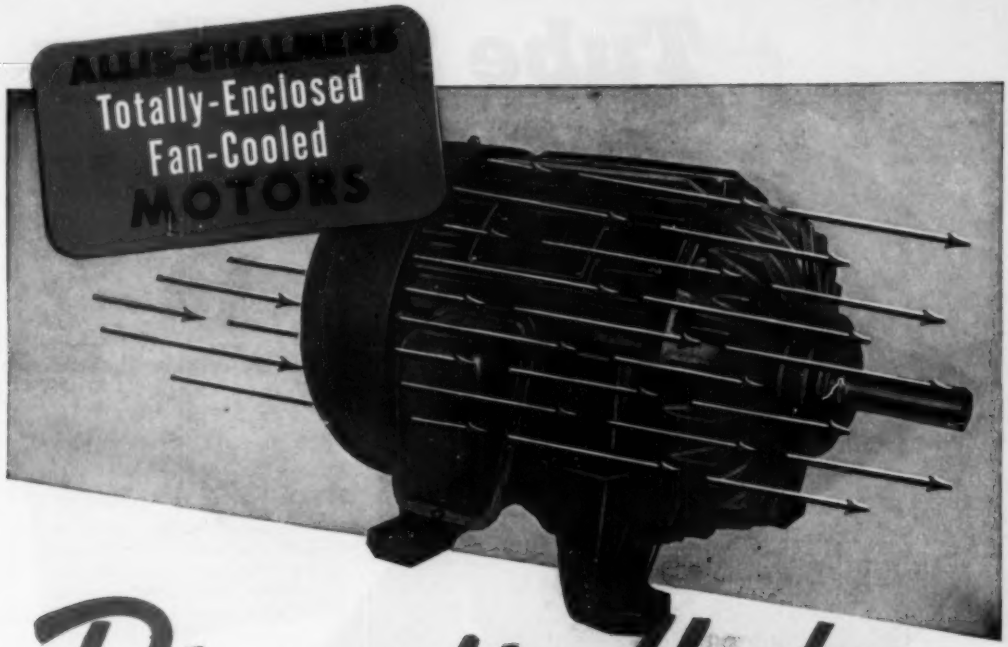
OTHER PRODUCTS
Collodions
Ethylene
Nitrocellulose Solutions
PIB*—Liquid Isolation
Urethan, U.S.P.
Special Chemicals and Solvents

*Reg. U.S. Pat. Off.

U.S.I. INDUSTRIAL CHEMICALS CO.

Division of National Distillers Products Corporation

60 EAST 42nd ST., NEW YORK 17, N. Y. U.S.I. BRANCHES IN ALL PRINCIPAL CITIES



Blows itself clean as a Whistle!

DIRT IS CARRIED AWAY by cooling air blown over the ribbed cast iron frame and bearing housings of this new Allis-Chalmers tefc motor. That means less motor cleaning . . . inspection . . . overhaul!

Concealed air passages and pockets have been eliminated. Dirt can't build up to cause overheating. And as for oily dirt that sticks — just wipe or blow it off.

Studies show that on most applications, totally-enclosed fan-cooled motors more than pay back their extra cost in reduced maintenance. And this new Allis-Chalmers Type APZ tefc motor makes maintenance costs lower than ever before.

Rigid Construction

The frame is cast iron which has high resistance against corrosion and distortion. Bearings are pre-lubricated at the factory and should need no attention for years. Tapped holes with pipe plugs to permit regreasing and to provide grease relief are standard equipment.

Get All The Facts

The new Allis-Chalmers Type APZ totally-enclosed fan-cooled motor is built in all NEMA standard frame sizes from 224* to 505. Also in explosion-proof type. Your A-C Authorized Distributor or District Office has complete information. Call today, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B7225. A-3427

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types from ½ in. to 72 in. discharge and up.

Texrope and Vari-Pitch are Allis-Chalmers trademarks.

ALLIS-CHALMERS A-C

*Similar design non-ventilated motors Type APK, also available in frames 203 to 224 inclusive.

Tube Swelling Can't Happen Here

NO TUBE SWELLING... NO PRESSURE LOSS... WITH THIS SPECIAL STAINLESS STEEL INNER WIRE BRAID

Here's the special stainless steel inner wire braid that puts CONCORD #20 Steam Hose in a class by itself. The constant inside diameter assures full steam pressure at all times.

Concord #20
STEAM HOSE

Most steam hose fails for one main reason: tube swelling. But this failure will never shorten the life . . . *or lessen the dependability* . . . of patented CONCORD #20 Steam Hose.

For this hose is constructed with a special stainless steel inner wire braid that cannot swell.

This means that you will always have a full pressure flow because tube constriction can't occur.

Too, when re-coupling becomes necessary, you'll be able to do it easily, quickly, with no complications.

Other construction features of this great steam hose: alternate high tensile steel wire and rubber layers firmly bonded over the outside of the tube for maximum burst protection. Asbestos braid provides positive cover adhesion and acts as cover insulator. And the tough, abrasion-resistant cover withstands the most severe abuse.

CONCORD #20 . . . flexible, tough, dependable...is the steam hose you'll want to have working for *you!*

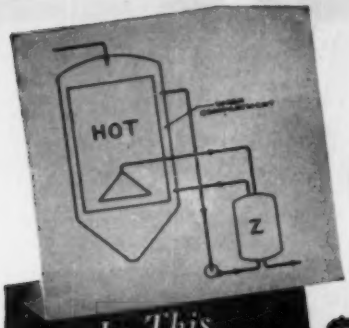
B·W·H
DEPENDABLE SUGGESTIONS

Another Quality Product of

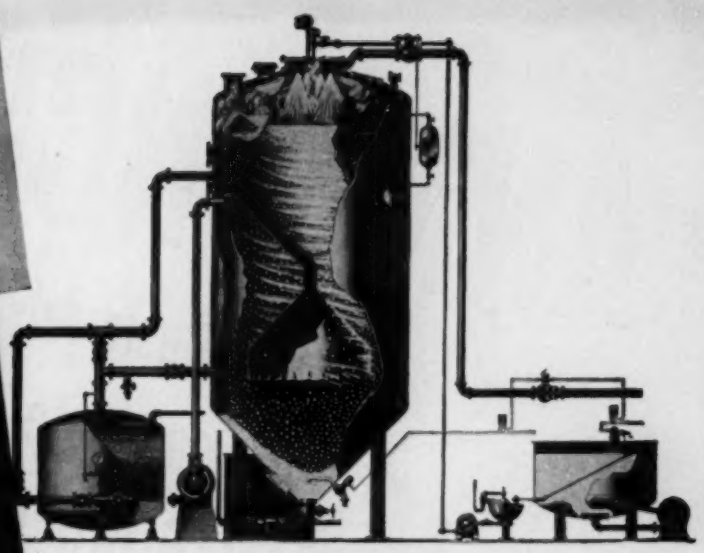
BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all Principal Cities

PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U. S. A.



In This
WORTHINGTON
HOT-Z
Deaerating Type Water Conditioning System . . .



Built-In Annular Wash Water Compartment Supplies and Reclaims Backwash Water

Independent of the Softening Process

No other Hot Zeolite System offers you so many advantages as this Worthington Hot-Z System. A quick review of the vital facts will show you why.

As you probably know, Hot Zeolite beds require periodic expansion to minimize packing and friction loss, and to insure efficient contact of each Zeolite particle with its share of dissolved impurities. This need for bed expansion occurs not only during the regeneration routine, but also several times during the period between regeneration routines. That's why it is important for you to use clean, softened water, preferably at normal operating temperature, for the reverse flow or "backwash" operation.

Worthington does it!

The Worthington Standard Hot-Z System with its backwash feature provides a built-in annular wash water compartment that supplies and reclaims backwash water . . independent of the system's softening process. In this compartment, backwash water is cleaned and maintained at normal operating temperature.

This backwash feature pays off particularly in systems employing filters because it *makes filter beds last as long as eight years.*

Other advantages

Worthington Hot Process Systems come equipped with modern, direct contact vent condensers. This means, no more of the scaling trouble that made the old-fashioned shell and tube types such a nuisance.

In addition, Worthington Hot-Z Systems operate on low-priced lime and salt. That's why the average installation saves enough in chemical costs to pay for itself in 3 years.

Get all the facts!

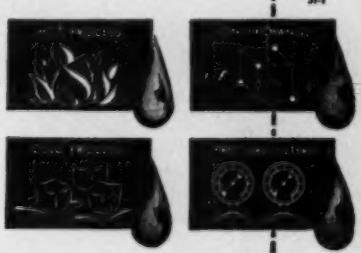
It will pay you to investigate the Worthington Hot-Z System thoroughly. Tell us your conditions of service and get our recommendation in terms of dollars and benefits. You'll find in our Hot-Z System, as in so much other equipment, *there's more worth in Worthington. Worthington Pump and Machinery Corporation, Water Treating Section, Dunellen, N. J.*

B-1

WORTHINGTON

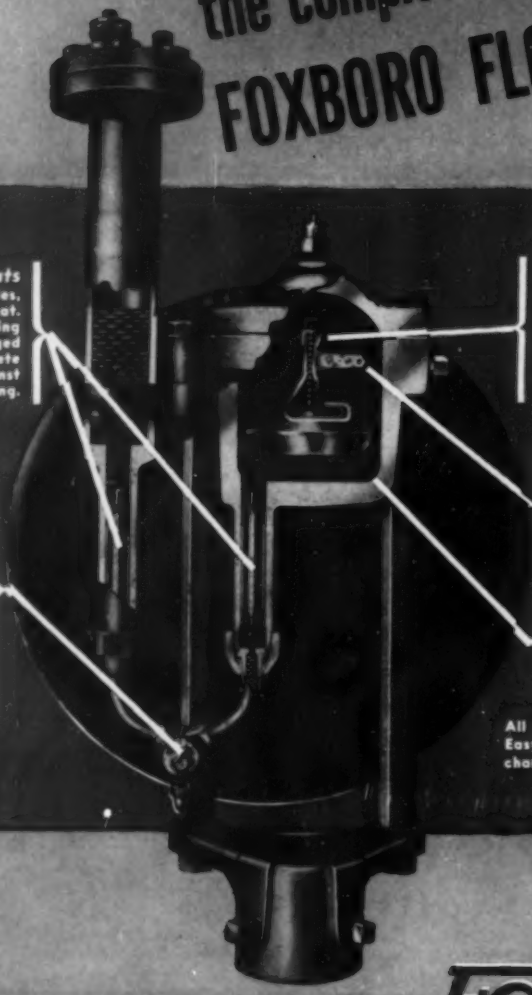
WATER CONDITIONING

Worthington Makes More of the Equipment for All Types of Water Conditioning Systems



ANNOUNCING

New Basic Advances in the complete line of FOXBORO FLOW METERS!



NEW Check Floats with redesigned guides, ball plug and seat. Insure perfect seating every time! Submerged in mercury for complete protection against frosting and fouling.

NEW U-Bend and Damping Plug Assembly. Easy to make up tight every time because of self-aligning all-welded construction. No gasket needed. Replaceable seats. Damping plug fully adjustable under pressure. Directed drain for mercury at lowest point.

NEW Segmental Drive Assembly with stainless steel ball chain that insures free travel of float, and with positive collet-type bearing shaft clamp. Assembly also available in Type 28 Meters with complete ambient temperature compensation —an exclusive new Foxboro feature.

NEW Pressure-Seal Bearing. Revolutionary ring seal gives unequalled freedom from friction, and complete freedom from leaks, at any working pressure. Factory-lubricated—no lubricator required. Shaft and bearing both of Type 316 stainless steel.

NEW Compact Float Chamber gives greater accessibility for easier, quicker cleaning.

All parts freely interchangeable. Easy substitution of range chambers.

FOXBORO.

REG. U. S. PAT. OFF.

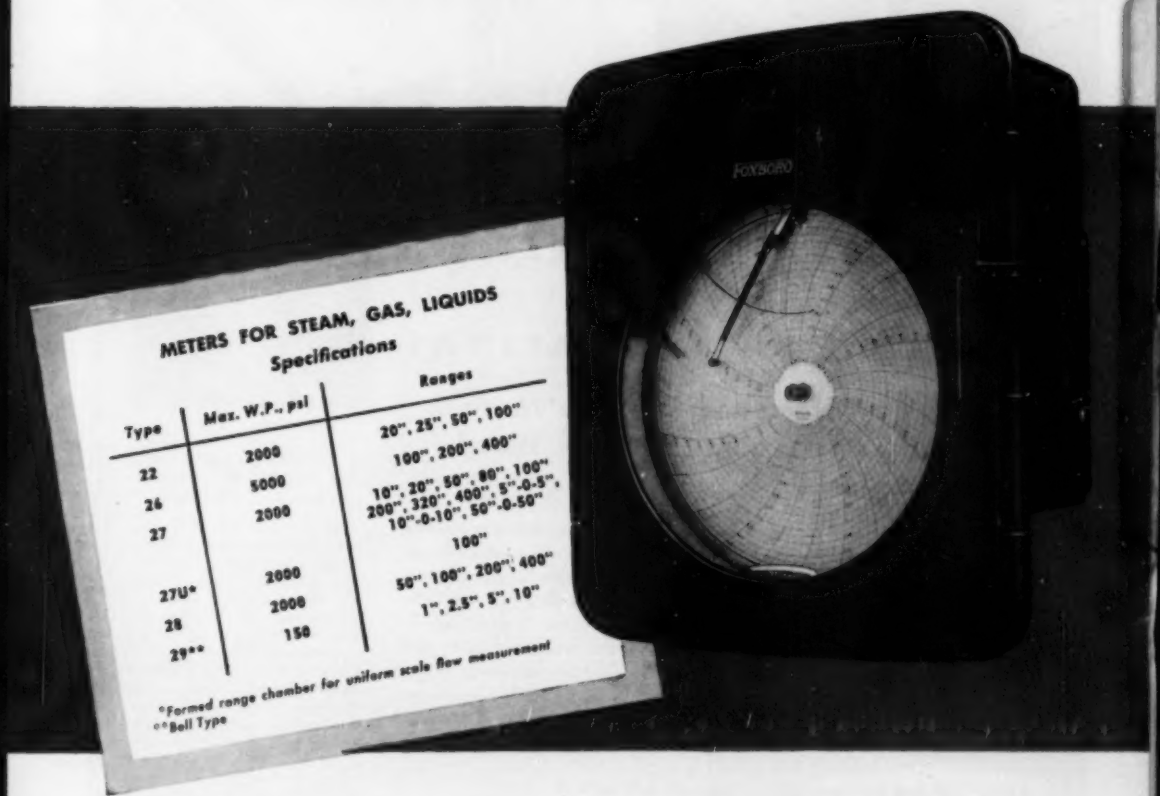
FACTORIES, IN THE UNITED STATES, CANADA AND ENGLAND

Higher sustained accuracy, less maintenance than ever before!

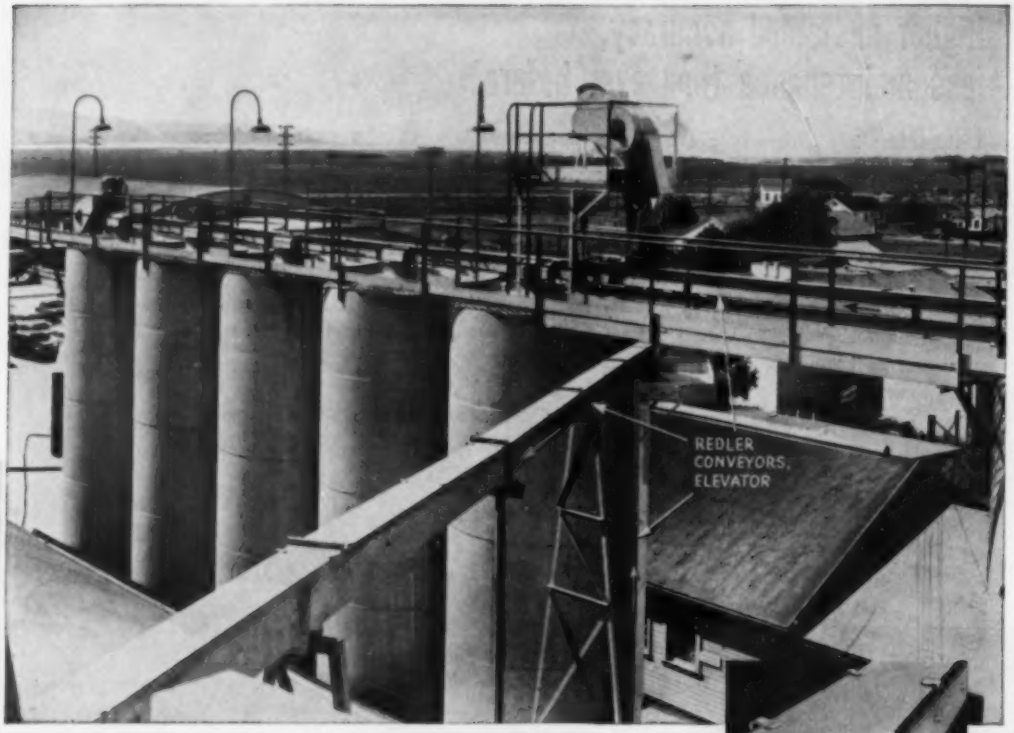
Outstanding improvements in every basic detail of differential meter design now afford a new complete line of Foxboro Flow Meters that set an unprecedented standard of dependable accuracy.

In addition to the important features outlined on the opposite page, these new meters retain all the uniquely advantageous features of the previous Foxboro line, including large floats with long travel for added power; and floats located in high pressure chamber to minimize ambient temperature effects. The combined result is practical metering performance that's farther ahead of the field than ever before . . . in maintenance-freedom as well as sustained accuracy.

Check up on all the advantages of the new Foxboro Flow Meters. Available in round or rectangular cases . . . as indicators, recorders, controllers or transmitters . . . with or without integrators. There's a type for every metering problem. Write for New Bulletin 460. The Foxboro Company, 3810 Neponset Ave., Foxboro, Mass., U.S.A.



. . First in FLOW METERS



NO WEATHER DAMAGE!
NO SPILLAGE!
NO CONTAMINATION!

REDLER Conveyors and Elevators Move, Place and Reclaim Bulk Chemicals Stored in Outdoor Tanks

Insecticide chemicals handled to and from outdoor storage tanks must be fully protected against the elements, foreign materials and loss of volume. S-A engineers provided an installation of REDLER Conveyor-Elevators to assure volume handling with cleanliness, efficiency and economy.

For the past 50 years S-A engineers have dealt successfully with all types of bulk materials handling problems. They have a complete line of bulk handling equipment from which to recommend the exact type of equipment best suited for your needs. *Write for a free survey by an S-A engineer.*

CALIFORNIA SPRAY-CHEMICAL CORPORATION
Richmond, California

At this plant fine-mesh bulk chemicals are deposited in and withdrawn from eight outdoor steel storage tanks. Three REDLER Elevators lift material through enclosed casing to top of tanks and distribute it through a long, horizontal REDLER Conveyor. Other horizontal REDLER Conveyors reclaim chemicals below the tanks for delivery to processing operations. Through a gate-regulated, two-way chute, from the one elevator shown, chemicals may either be returned to the tanks or moved to the plant through the horizontal REDLER Conveyor shown in the foreground.

1901-1951
50 years experience with bulk handling
STEPHEN S-A ADAMSON MFG. CO.
3 Ridgeway Avenue, Aurora, Illinois · Los Angeles, Calif. · Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

ALUMINUM

FABRICATION BY GRAVER

EXCELLENCE OF TECHNIQUE REFLECTED IN REPEAT ORDERS

The skillful workmanship and rigid quality controls which produced three Graver-built aluminum bins — specially designed for the process system of a large organic chemical plant — are evidenced by a recent re-order.

This is another example to verify the fact that industries of many types rely on Graver for precision and precaution in alloy fabrications. It also indicates the excellence of Graver workmanship — both in the shop and in the field.

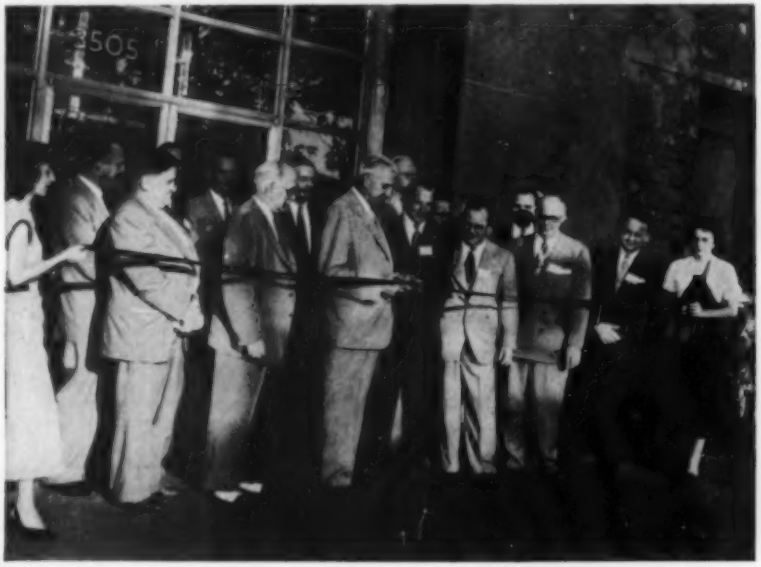
GRAVER TANK & MFG. CO., INC.
EAST CHICAGO, INDIANA

NEW YORK • CHICAGO • PHILADELPHIA • WASHINGTON
DETROIT • CINCINNATI • CATASAUQUA, PA.
HOUSTON • SAND SPRINGS, OKLA.

Aluminum Bin — 12' dia. x 31'3" long fabricated by Graver for Gulf Coast chemical plant.

Life ...on the

TO BETTER SERVE ITS CUSTOMERS, American Cyanamid has consolidated its divisional Chicago offices and warehouses into this one modern building located in the Addison Kimball District of the city. This consolidation is part of an overall plan to give quicker, better service to customers in major cities of the United States and Canada. Consolidated offices were recently opened in Los Angeles and St. Louis, with new locations in Boston and Montreal to be announced shortly.



CUTTING THE RIBBON, Mr. R. C. Gaugler, President of American Cyanamid Company, officially opens the company's new Chicago offices and warehouses. From this modern brick and steel, two-story building with 100,000 square feet of floor space, Cyanamid's Agricultural Chemicals Division, Calco Chemical Division, Explosives Department, Industrial Chemicals Division, Lederle Laboratories Division, and the Plastics and Resins Division will operate.

Chemical Newsfront

WHITE STAYS WHITE when Cyanamid's Retarder PD Anti-Scorch Agent is used to help get better results in rubber formulations. This compound helps to prevent scorching at processing temperatures and has little retarding effect at curing temperatures. It will not discolor white or light-colored stocks, nor affect the physical properties or aging qualities of vulcanized stocks.

SUTURES THAT "TELL TIME" are produced by a Cyanamid subsidiary, Davis & Geck, Incorporated. One of the world's foremost manufacturers of surgical sutures—D&G has developed a method of tanning catgut which enables it to hold wounds together for definite, *predictable* periods of time before absorption into the tissues. This remarkable aid to surgery is another example of the results of the expanding research and development program now being carried out by Cyanamid and its associated companies.

SUNLIGHT AND LAUNDERING can be very destructive to colored fabrics. Vat Dyes, made by Cyanamid's Calco Chemical Division, have enabled textile manufacturers to produce cotton, wool and viscose materials of remarkable color fastness. Calco's Vat Yellow, for example, produces a clear, bright yellow that excels all other vat yellows in fastness to light, chlorine, towel bleach and washing —making it an excellent dye for dress goods, towels, draperies and similar uses. Other Calco Vat Dyes are available to meet a wide variety of applications.

American Cyanamid Company C-E-10-51
30 Rockefeller Plaza, New York 20, N. Y.

Please send literature or further data on the items checked:

- ☐ Retarder PD Anti-Scorch Agent
- ☐ New Surface Active Agents
- ☐ Davis & Geck Sutures

Name.....*Position*.....

Company.....

Address.....

City.....*State*.....

In Canada: North American Cyanamid Limited, Toronto and Montreal

AMERICAN *Cyanamid* COMPANY

30 ROCKEFELLER PLAZA NEW YORK 20, N. Y.

"MANY TIMES LONGER LIFE FOR EQUIPMENT ON H_2SO_4 JOBS"

report users of *Carpenter* STAINLESS NO. 20...

Fractionating tower parts can stay on the job longer *without replacement* when they are made from Carpenter Stainless No. 20.

Immersion heating unit with a sheath of Carpenter Stainless Tubing No. 20 stands up under almost continuous attack by *sulphuric, nitric, formic and other acids.*

In sulphonation or other processes which cause the formation of sulphuric, formic, acetic and other highly corrosive agents, Carpenter Stainless No. 20 is increasing equipment life from two to twenty times.

Where an essential process must keep going, with minimum interruption for equipment maintenance or replacement, this relatively new wrought Stainless Steel may be your answer.

Similar in analysis to "Durimet 20", Carpenter Stainless No. 20 is produced in the forms of tubing, pipe, sheet and plate. Bar stock, wire and strip are produced by the Carpenter mill at Reading, Pa.

New 16-Page Book of Technical Data

For complete information on No. 20 and the jobs it can do, write us a note on your company letterhead and ask for the new Carpenter Stainless No. 20 book. If you now have a typewritten bulletin about No. 20, replace it with this new book.

THE CARPENTER STEEL CO.
Alloy Tube Division • Union, N. J.

Export Department: The Carpenter Steel Co.
Reading, Pa.—"CARSTEELCO"

Carpenter

STAINLESS NO. 20

Licensed under patents of The Duriron Co., Inc.

Yours for the asking—

ON THIS SIDE – Data on the WeldELL line

ON THIS SIDE

– Data on Taylor Forged Steel Flanges

A VOLUME OF DATA

. . . covering welding fittings and forged steel flanges . . .

ON A SINGLE SHEET

Here is just about the handiest tool ever devised for the pipe designer. Data on welding fittings and flanges that otherwise could be found only by plowing through many catalog pages and tables have been ingeniously condensed on the two sides of the durable letter-size card illustrated above.

One side covers the broad WeldELL line of Taylor Forge welding fittings. For every nominal pipe size, ½" through 30", it shows the wall thickness for every weight of every fitting in every available material. It also shows all required dimensions of all types of fittings.

The other side covers the world's most complete line of forged steel flanges. For every nominal pipe size, ½" through 24", it gives all essential dimensional and bolting data for all types of flanges in all weights. A particularly useful table (see reproduction) is that showing welding neck flange bores which enables you to determine the I.D. of any nominal pipe size without separate calculation. Thus the sheet gives you O.D. and I.D. of any weight of pipe.

The card is varnished to make it stand the steady usage you are certain to give it. To obtain your copy see your Taylor Forge distributor or **MAIL THE COUPON.**

TF

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS

General Offices and Works: P. O. Box 485, Chicago 90, Ill.
Offices in all principal cities.
Plants at: Carnegie, Pa.; Fontana, Calif.; Hamilton, Ont., Canada

Please send me one of your fitting and flange sheets:

NAME_____

POSITION_____

COMPANY_____

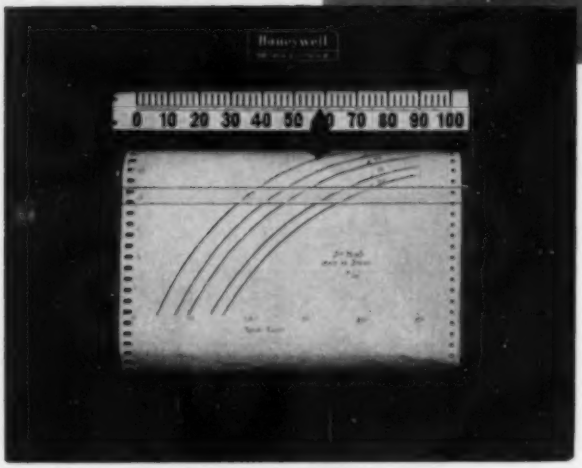
STREET ADDRESS_____

CITY_____ ZONE____ STATE_____

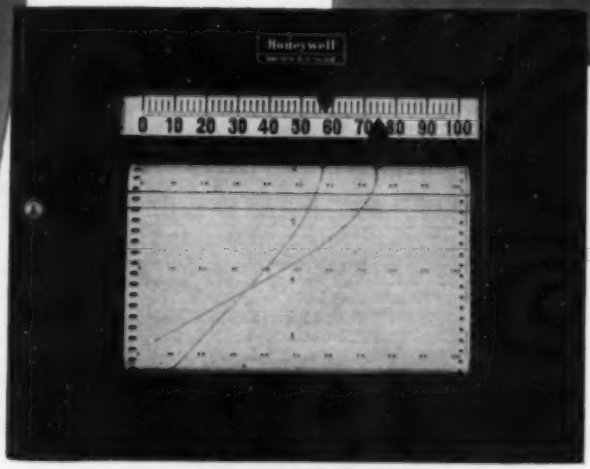
Mail to Taylor Forge & Pipe Works, P. O. Box 485, Chicago 90, Ill.

313-1051

THESE NEW INSTRUMENTS SHOW VARIABLE COMPARISONS AT A GLANCE



FUNCTION PLOTTER
Send for Data Sheet 10.0-5



DUPLEX RECORDER
Send for Data Sheet 10.0-6

The *ElectroniK* Function Plotter

Records a Precise and Continuous Curve of $y=f(x)$

Gone are the days of labored hand plotting . . . logging countless readings . . . missing in-between values . . . consuming valuable time. Now you can automatically record a precise and continuous curve representing the relation of any two variables, that can be reduced to a d-c voltage, by connecting them to the new *ElectroniK* Function Plotter. Each and every point of the curve will be recorded *exactly as it is measured.*

Applicable to countless analyses and investigations, the *ElectroniK* Function Plotter is being used for plotting such curves as speed vs. torque, stress vs. strain, temperature vs. pressure, volume vs. pressure, force vs. displacement, hysteresis loops . . . and many others.

The *ElectroniK* Duplex Recorder

Simultaneously Plots Totally Independent Variables on One Chart

The possibilities of this instrument are practically limitless. You can make a before-and-after comparison of a measurable property as it enters and emerges from a processing stage or reaction . . . you can continuously measure practically any two variables on the same chart—compare and study these variables without effort, save valuable time and eliminate possibility of error in cross reference.

The instrument permits any two variables to be recorded as a function of time. By using a Selsyn motor, it can be used to record two independently measured variables as a function of motion or displacement. Since the two measuring circuits are entirely separate, actuations and ranges are supplied to suit the requirements of the application.

MINNEAPOLIS-HONEYWELL REGULATOR Co., *Industrial Division*, 4478 Wayne Ave., Philadelphia 44, Pa.

MINNEAPOLIS **Honeywell**

Brown Instruments

What's U.S. Rubber doing to prevent spool breakage?

The spools on this wire coating machine are made of Uscolite, U.S. Rubber's new plastic. They can deform under loads without breaking to a greater extent than metals can.

PRODUCT OF

U.S. RUBBER

SERVING THROUGH SCIENCE

This Uscolite pipe was only dented after being hit by a .44 calibre revolver bullet fired from 20 yards. This amazing plastic is light in weight, extremely versatile.

● "U.S." makes spools of Uscolite, a remarkable plastic which is replacing many other materials, including other plastics. These spools do not chip and get rough around the edges, as do metal spools. Uscolite spools have low thermal conductivity hence wire spooled when hot stays tight upon cooling. A wide variety of products are made of Uscolite, including many types of piping. This great material is resistant to most chemicals, has high impact strength, is furnished in standard lengths; pipe can be cut to size and threaded on the job. For more information write to address below. In Canada, write to Dominion Rubber Company, Montreal.

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

SW SPROUT WALDRON MUNCY, PA.

pointers to BETTER PROCESSING

Streamlined Materials Handling of Bulk Chemicals

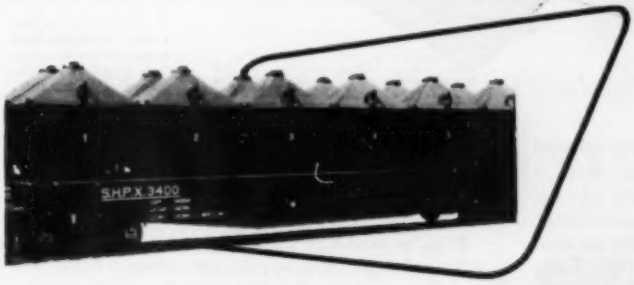
For years calcium carbide, used in acetylene and synthetics, was shipped in 1000 lb. steel drums. Loading a shipment of carbide was slow, arduous work, eating up plenty of man-hours. Depreciation on drums due to rough handling was especially high. And, loss through spillage was an evil accepted by both manufacturer and consumer.

The growing demand for carbide by large industrial users necessitated a more efficient, economical method of handling carbide in bulk.

The SOLUTION: A five-ton capacity, all-steel, air-tight portable container which discharges directly to the acetylene generator. Units can be nested by the dozen on flat cars or loaded on trucks in sets of three.

RESULT: Each container holds 10 times more carbide... is filled, sealed, and moved mechanically with lowest costs ever!

Sprout-Waldron built over 2500 of these specially designed containers. Why not take advantage of this wealth of experience? We can also *help you* cut corners in the moving of bulk chemicals.



For further information about this equipment write to Sprout, Waldron & Co., Inc., 15 Waldron St., Muncy, Pa.

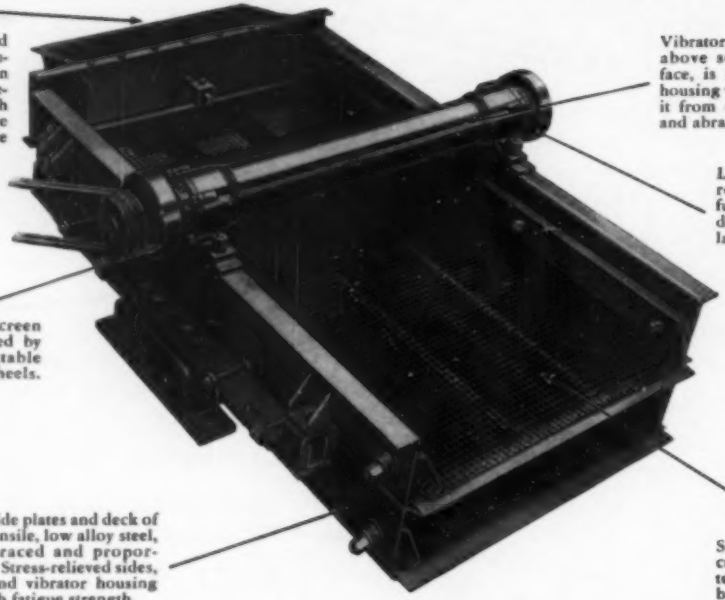
Sprout-Waldron
Manufacturing Engineers
SINCE 1866
MUNCY • PENNSYLVANIA

I LOOK TO SPROUT-WALDRON for BETTER PROCESSING EQUIPMENT

- **Accurate sizing...**
- **High capacity...**
- **Low operating costs...**

YOU GET ALL 3

with LINK-BELT "UP" Vibrating Screens


Vibrating feed hopper and regulating gate can be supplied to reduce screen cloth wear, distribute feed over entire deck width.
Vibrator, located well above screening surface, is in heavy steel housing which protects it from dust, moisture and abrasion.
Liberal self-aligning roller bearings are further guarded from dirt and moisture by labyrinth seals.
Amplitude of screen is easily changed by resetting adjustable unbalancing wheels.
Main side plates and deck of high-tensile, low alloy steel, well braced and proportioned. Stress-relieved sides, deck and vibrator housing for high fatigue strength.
Screen cloth is securely clamped and tensioned over rubber covered, cambered deck structure.

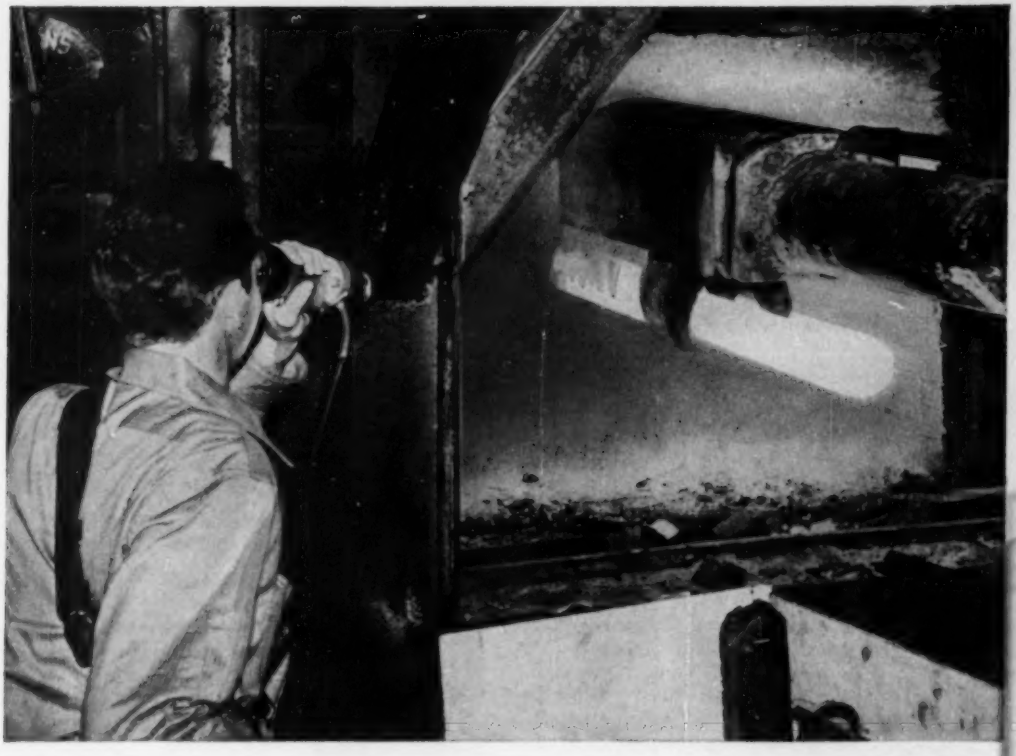
YES, the efficient two-bearing operation of Link-Belt "UP" Vibrating Screens offers real economies in the screening of fine, light materials. Positive, high-frequency action of the vibrator mechanism provides quick bed stratification . . . maximum sizing opportunity for every particle. Blinding, even on the smallest cloth sizes, is virtually eliminated. And you'll like the lower power and maintenance costs, thanks to two-bearing simplicity.

If you're faced with a screening problem, call the Link-Belt office near you. One of our screening experts may be able to offer you a money-saving answer.

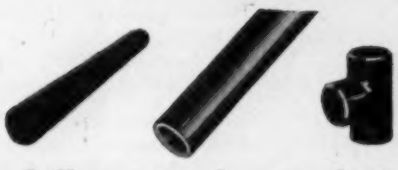
LINK-BELT

VIBRATING SCREENS

LINK-BELT COMPANY—Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12,436



GLOBE



Complete Process Control... from billet – to tube – to fitting

assures you the finest in WELDING FITTINGS

Only Globe's precision process of manufacturing seamless welding fittings *begins with the billet*! For Globe alone among welding fitting manufacturers produces seamless tubing . . . and Globe alone has the facilities to provide exact technical control at every stage of manufacture — from billet — to tube — to fitting — *in its own plant.* That's one reason why users who want dependable fittings specify Globe!

GLOBE STEEL TUBES CO.
MILWAUKEE 46, WISCONSIN

Chicago • Cleveland • Detroit • New York • Philadelphia • St. Louis • Denver • San Francisco • Glendale, Cal.

Producers of Globe seamless stainless steel tubes — Gloweld welded stainless steel tubes — alloy — carbon — seamless steel tubes — Globeiron (high-purity ingot iron) seamless tubes — Globe Welding Fittings.

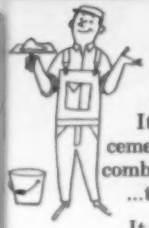
For complete information on the finest welding fittings available anywhere, send for the Globe Welding Fittings Catalog.

There's an

Eagle-Picher Insulation

that can help you control

temperatures accurately...economically!



Here's just one of the many efficient, economical Eagle-Picher Insulations. It's Eagle-Picher one-coat, all-purpose cement—a revolutionary new product that combines insulating and finishing materials ...that goes on in one easy-to-apply coat.

It gives your equipment highest possible thermal efficiency... cuts operating costs by saving fuel... and helps to provide perfect, precise control on temperatures.

Whatever your requirements... there's an Eagle-Picher Insulation that can fit your needs. Find out about them right away!

THESE EAGLE-PICHER PRODUCTS CAN SAVE YOU MONEY ... POWER ... TIME

Insulating Felts Supertemp Blocks* Blankets*
Loose Wool Pipe Covering* Stalastic*
Insulseal Insulstic* Swetchek* Finishing Cements* Insulating Cements* Fireproofing Cement* Diatomaceous Earth Blocks*

EAGLE-PICHER ONE-COAT, ALL-PURPOSE CEMENT!

A combination insulation and finishing material for temperatures to 1000 F. It's quick setting, rust-inhibitive... has light color, smooth surface, negligible shrinkage. It has exceptional adhesive qualities on ferrous metals and insulation materials. And it's unaffected by rain or moisture after it sets!

EAGLE EP PICHER

THE EAGLE-PICHER COMPANY • *General Offices: Cincinnati (1), Ohio*

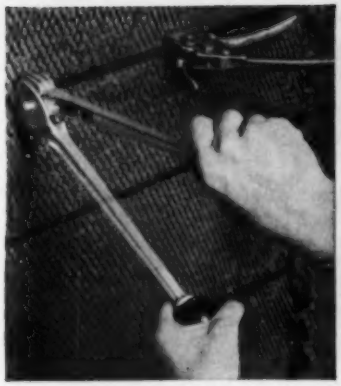
Insulation products of efficient mineral wool — for a full range of high and low temperatures.
Technical data on request.

Since 1843.

2172

These efficient, versatile insulations "team up" to give perfect insulation for every major application

For a completely effective, low-cost insulation combination, you can't beat the teamwork of Eagle-Picher Mineral Wool Blankets, Supertemp Blocks, Diatomaceous Earth Blocks and Earth Fill, and Super "66" Cement. They work effectively to give your equipment highest possible thermal efficiency . . . cut operating costs by saving the maximum amount of fuel . . . and help to provide perfect, precise control over temperatures.



EAGLE-PICHER MINERAL WOOL BLANKETS

These blankets satisfy the need for a convenient method of quickly and efficiently insulating flat or curved surfaces on larger types of heated equipment. Mineral wool is felted and secured between flexible metal fabric. Outstanding physical and chemical stability enables Eagle-Picher Blankets to resist water, steam, corrosive fumes and normal vibration.

EAGLE-PICHER SUPERTEMP BLOCKS

Eagle-Picher Supertemp Blocks are lightweight (approximately 16 lbs. per cu. ft.). Can be cut easily with knife or saw to fit off-shaped arens . . . they fit snugly over minor irregularities. They're strong and have high refractory value. Withstand temperatures up to 1700 F. Conductivity at 512 F. approximately 0.53 . . . all standard sizes, from 2" x 18" to 12" x 36" in thicknesses from 1" to 4".

EAGLE-PICHER SUPER "66" INSULATING CEMENT

Super "66" is all-purpose, rust-inhibitive, extremely adhesive insulating cement. "Springy ball" pellets don't collapse after application . . . give great coverage, retain their thermal efficiency. 100 lbs. covers approximately 55 sq. ft. —1 inch thick. Easily applied with trowel, over flat and irregular surfaces. Efficient for temperatures up to 1800 F. Reclaimable when used on equipment whose temperatures do not exceed 1200 F.

Eagle-Picher, as a member of the Industrial Mineral Wool Institute, urges that you look for this label. It is a certification by the manufacturer that his mineral wool product conforms to Commercial Standard CS 117-49 as issued by National Bureau of Standards, U.S. Department of Commerce in cooperation with the Industrial Mineral Wool Institute, New York, N.Y.

Igloo or Jet Engine...

Wherever temperatures are important to you, there's a dependable American Thermometer or Temperature Measuring Instrument for the purpose. The line is so complete, selection for specific needs is easy, whether you require accurate temperature measuring instruments to safeguard product quality, protect equipment or control costs.

American Thermometers and Temperature Indicators and Recorders are available in ranges from minus 100°F. to plus 3000°F., with *actuation by mercury, vapor pressure, gas, bi-metal or thermocouple* —depending on instrument type and requirements. And, to indicate or record temperatures accurately as far as 250 feet from the temperature source, famous "Magic Pulse" self-compensating capillary tubing can be supplied.

Whether you must know the exact temperature of a kiln, processing vat, deep freeze – anything hot or cold – choose from the many fine American Thermometers and Temperature Measuring Instruments. New catalog gives complete details.

Stocked and Sold By Leading Distributors

AMERICAN RECORDING THERMOMETERS

Single, double, or triple pens in round or rectangular cases. 10-inch chart with effective scale width of 3⅝" for easy, accurate reading. Chart Drive: 24-hour spring wound or electric. Actuation: mercury, vapor pressure, or gas. Ranges from minus 60°F. to plus 1000°F.

AMERICAN TEMPERATURE INDICATORS

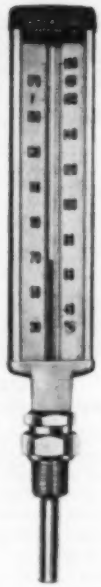
A radically new pyrometric-type instrument. Combines the unique Microsen Balance with the sensitivity of thermocouple measurement. Extremely accurate, rugged, dependable. Power actuated pointer. Ranges from minus 100°F. to plus 3000°F. American Temperature Recorder also available.

AMERICAN DIAL THERMOMETERS

Clear, bold figures on exactly graduated dials; pointer of contrasting color. Actuation: mercury, vapor pressure, gas, or bi-metal. Ranges from minus 60°F. to plus 1000°F. Cases for stem, wall, or flush mounting.

AMERICAN INDUSTRIAL GLASS THERMOMETERS

Full scale opening of 7", 9", or 12" with easy-to-read red mercury tubing. Ranges from minus 60°F. to plus 1150°F. Straight and angle forms.



1850 AMERICAN USA

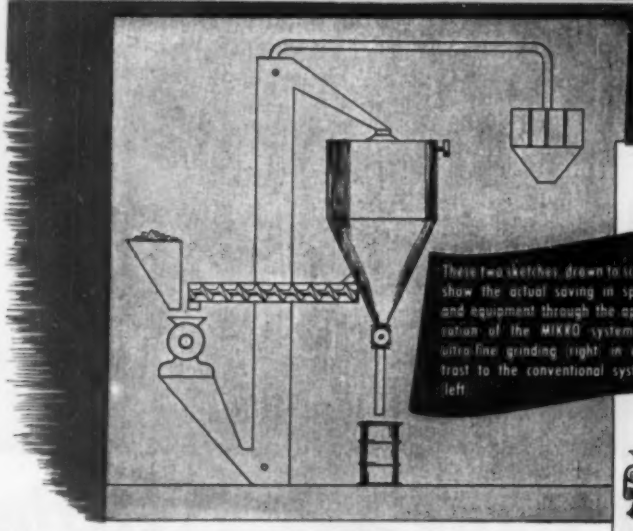
AMERICAN INDUSTRIAL INSTRUMENTS

A product of **MANNING, MAXWELL & MOORE, INC.** STRATFORD, CONNECTICUT

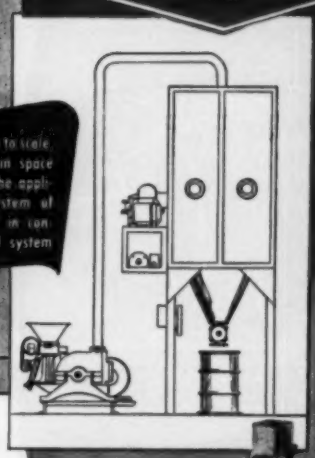
MAKERS OF 'AMERICAN' ELECTRICAL AND INDUSTRIAL INSTRUMENTS, 'HANCOCK' VALVES, 'ASHCROFT' GAUGES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES. BUILDERS OF "SHAW-BOX" CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.

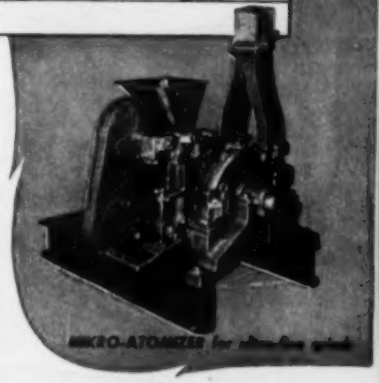
SAVE AND SIMPLIFY

By this Process of ELIMINATION and REDUCTION



These two sketches drawn to scale show the actual saving in space and equipment through the application of the MIKRO system of ultra-fine grinding (right) in contrast to the conventional system (left).





MIKRO-ATOMIZER for ultra-fine grinds

The MIKRO-ATOMIZER . . .

ELIMINATES: **Air Separator— Bucket Elevator — Screw Conveyor**

REDUCES: **Headroom — Floor Space — Extra Handling or Equipment**

If your need is for ultra-fine grinds requiring air classification rather than screening, the MIKRO-ATOMIZER is your complete answer. It is an entire system producing perfectly blended grinds in the lower micron range in a single pass at exceptionally low temperature rises . . . . . A 3-function machine eliminating much of the accessory equipment used in conventional systems.

With its built-in air separator, the MIKRO-ATOMIZER simplifies the flow chart by grinding, air-classifying and conveying in one operation. And its 3-function service is reflected in 3-fold saving:—lower initial and maintenance costs . . . lower cost of production per hp/hr as compared with conventional systems . . . substantial economy in operating space, or in construction costs if you are planning a new building.

Slight adjustments in the MIKRO-ATOMIZER permit varying degrees of fineness. If necessary you can actually produce two degrees of fineness in one operation.

If you have ultra-fine grinding problems don't fail to investigate this 3-function MIKRO.

SEND FOR **special MIKRO-ATOMIZER bulletin**

Other members of the MIKRO "family:"

The MIKRO-PULVERIZER
—for granular or fine grinds.

The MIKRO-COLLECTOR
—for general air clarification and saving material thru adequate dust control.

1152

MIKRO-PULVERIZER
MIKRO-ATOMIZER
Reg. U. S. Pat. Off.
Also Makers of the MIKRO-COLLECTOR

PULVERIZING MACHINERY COMPANY
55 Chatham Road Summit, New Jersey

PRESERVE OUR HERITAGE · FAITH, FREEDOM AND INCENTIVE

Brake motor using latest disk type brake mounted on BA drip-proof motor. Also available with totally enclosed and splash-proof enclosures for AC or DC applications.

Squirrel-cage splash-proof Form BA. Has corrosion-resistant covers which prevent entrance of splashing liquids.

Mill motor, W600 Series, DC. Conforms in all respects to AISE standards. Offers more power without an increase in the frame size.

If you have a drive that's dirty, dusty, damp or hot—

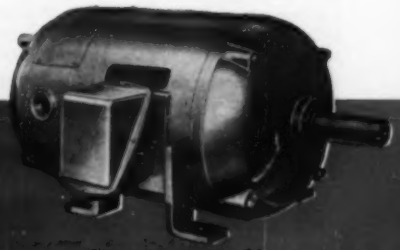
here's the motor for it!

...the

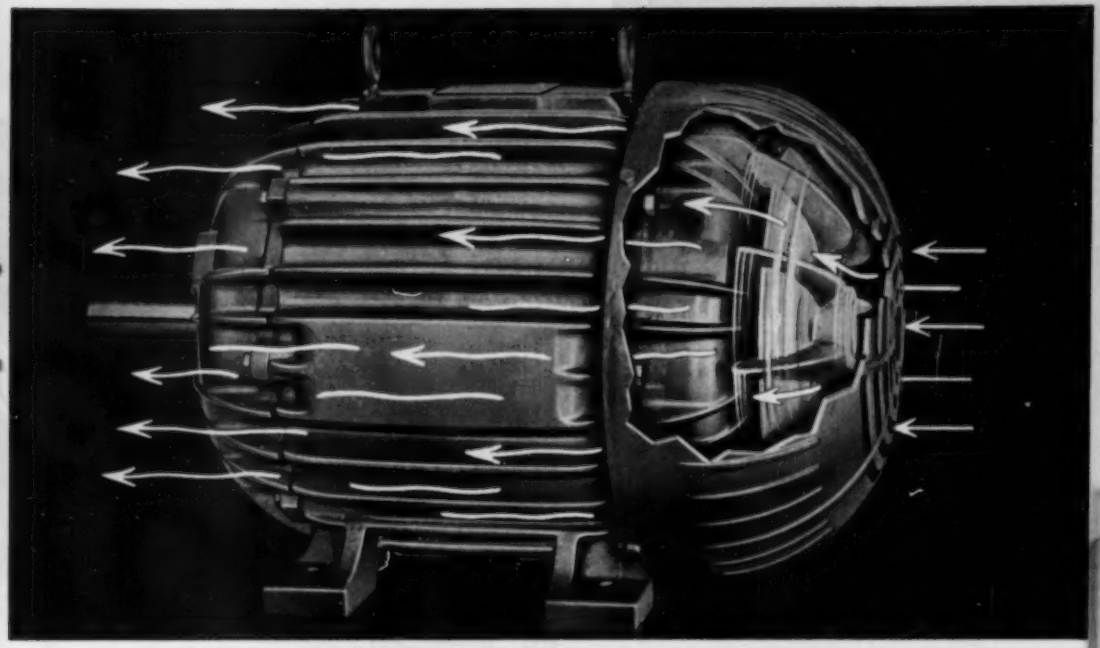
Elliott C-W Sealedpower totally-enclosed fan-cooled squirrel-cage motors are made in capacities from 3 to 125 hp. Write for Sealedpower Bulletin SL-300-2A.

Also available in explosion-proof underwriters approved, in capacities from 20 to 125 hp. For full details write for Bulletin SL-300-5. Address your request to Elliott Company, Dpt. CE, Jeannette, Pa.

...with the ELLIOTT CROCKER-WHEELER complete motor line, you can meet 'most any integral motor need!



Wound-rotor protected type Form BW. For slow, smooth acceleration, high starting torque with low starting current, or variable speed. Drip-proof, splash-proof, 1 to 200 hp.



ELLIOTT CROCKER-WHEELER *Sealedpower* MOTOR

■ This motor is really sealed. There's no way in for dirt, dust, moisture or fumes. But there *is* an easy out for heat—by way of the many fins which are constantly swept by the fan-driven air blast.

That powerful, continuous air blast sweeps off all dirt and dust. Only under unusually dusty conditions is cleaning necessary, and then rarely, with a quick dusting off. Backing off four capscrews removes the fan cowl, if you *should* want to get at the fan—which is hardly ever necessary.

DURING THE PAST TEN YEARS thousands of these Sealedpower motors have gone into successful service. They were ahead of the field then, and they still are.

ELLIOTT COMPANY
Crocker-Wheeler Division
AMPERE, N. J.

BRANCH OFFICES AND REPRESENTATIVES IN PRINCIPAL CITIES
ELLIOTT *Approved* SERVICE SHOPS COVER THE COUNTRY
General Offices & Main Plant — Jeannette, Pa.

HALF CENTURY OF 1901 EC 1951 POWER PROGRESS

CW-59

Squirrel-cage protected type Form BA. An open drip-proof motor for general purpose use. It is available in wide modifications to meet a variety of conditions.

DC drip-proof and drip-proof-protected-types Form F, in ratings to 7½ hp, Form H, 10 to 300 hp.

Squirrel-cage, totally-enclosed, non-ventilated Form BE. Available up to and including 3 hp at 1800 rpm, for applications requiring protection against dust, fumes, moisture.

FACTS about ANILINE

Today aniline is used extensively in many industries. Aniline is utilized in the manufacture of hydroquinones which are essential to the photographic and rubber industries. Aniline is an important ingredient in the anti-aging compounds used by rubber manufacturers to increase the life of rubber products. As a valuable intermediate, aniline is vital to the production of various dyes and pharmaceuticals, such as indigo, phenylhydrazine, acetanilid, acetoacetanilide. Also it is used in aniline-formaldehyde type resins which exhibit excellent electrical properties.

Despite current shortages of this material, Dow is extremely interested in helping you utilize aniline to best advantage in your manufacturing processes. Dow will gladly cooperate with you if you desire technical assistance or further information about the economical use of aniline. Write to Dow, using the coupon at right.

HANDLING

Aniline is commonly stored in plain steel tanks. These tanks should be vented to a safe place. Although there is no particular fire hazard involved, it is advised that vents should be equipped with flame arrestors. It is also good practice to ground all equipment in which aniline is used.

If possible, it is advisable to use aniline in closed equipment only. When this is not possible, suitable ventilating equipment must be installed. A down-draft exhaust is indicated since aniline vapors are heavier than air.

Properties and Specifications of Aniline

Aniline is a practically colorless, highly refractive, oily, poisonous liquid with a characteristic odor. It tends to darken on exposure to air or sunlight but remarkably little color change occurs if aniline is stored properly.

Freezing Point, °F.	21
Boiling Point, °F.	364
Flash Point, Open Cup, °F.	158
Specific Gravity (77°F./77°F.)	1.021
Solubility (g/100 g.solvent)	
Water (25°C)	3.5
Alcohol	∞
Ether	∞

SPECIFICATIONS

Boiling Range at 760 mm Hg	
IBP-DP, within	1.5°C.
5-95%, within	0.2-0.7°C.
Freezing Point, minimum	—6.3°C.
Nitrobenzene	None
Color	Colorless to straw

This is one of a series of Dow advertisements you may wish to keep on file for reference and information. Write Dow for reprints.

PROTECTIVE EQUIPMENT

Aniline is so readily absorbed that adequate protective equipment should be worn whenever contact is possible. This equipment should consist of a minimum of safety goggles, rubber gloves and apron, rubber shoes or boots and coveralls and underwear.

Whenever an aniline tank is to be entered it should be washed completely free of aniline and fumes. Anyone entering the tank should be provided with a proper harness and life line in addition to the previously mentioned equipment. Another individual should be watching the person in the tank from the outside at all times.

Any individual upon entering aniline equipment should be equipped with approved breathing equipment. This may consist of a positive pressure hose mask with hose inlet in a vapor free atmosphere or a self-contained breathing apparatus with stored oxygen or air. All masks and breathing apparatus should be approved by the U. S. Bureau of Mines and should be equipped with full face masks.

The precautions taken in unloading tank cars or other containers of any poisonous, flammable liquid should apply to the unloading of aniline.

TOXICITY INFORMATION

Aniline is highly toxic but it may be handled safely if proper care is taken. It is readily absorbed by the body upon contact, inhalation or ingestion. The first symptom of absorption of toxic quantities is cyanosis or blue lips. A feeling of "drunkenness" may exist for a short time followed by headache, drowsiness, nausea and vomiting. This may be followed by unconsciousness and death if exposure continues.

Toxic effects of aniline are generally acute; however, repeated exposure to low concentrations may give rise to what is called chronic aniline poisoning. However, upon complete cessation of exposure, individuals generally regain their normal health with no permanent pathology being in evidence.

FIRST AID

In the event of aniline contact, all contaminated clothing should be removed immediately and the person should be washed with large amounts of soap and warm water. All clothing should be thoroughly decontaminated before further use. In case of eye contamination, the eyes should be washed for at least 15 minutes with large amounts of flowing water. A physician should be summoned as soon as possible.

If aniline is ingested, the victim should be given immediately an emetic such as mustard and water or lukewarm soapy water. In any case mentioned previously or poisoning by inhalation, the patient should be removed from any further exposure . . . kept warm and be transported to the nearest medical attention.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

WRITE DOW FOR INFORMATION AND TECHNICAL ASSISTANCE.

The Dow Chemical Company, Dept. OC-31,
Midland, Michigan

☐ **Please send me additional information about aniline.**
☐ **Please send_____reprints of this advertisement.**

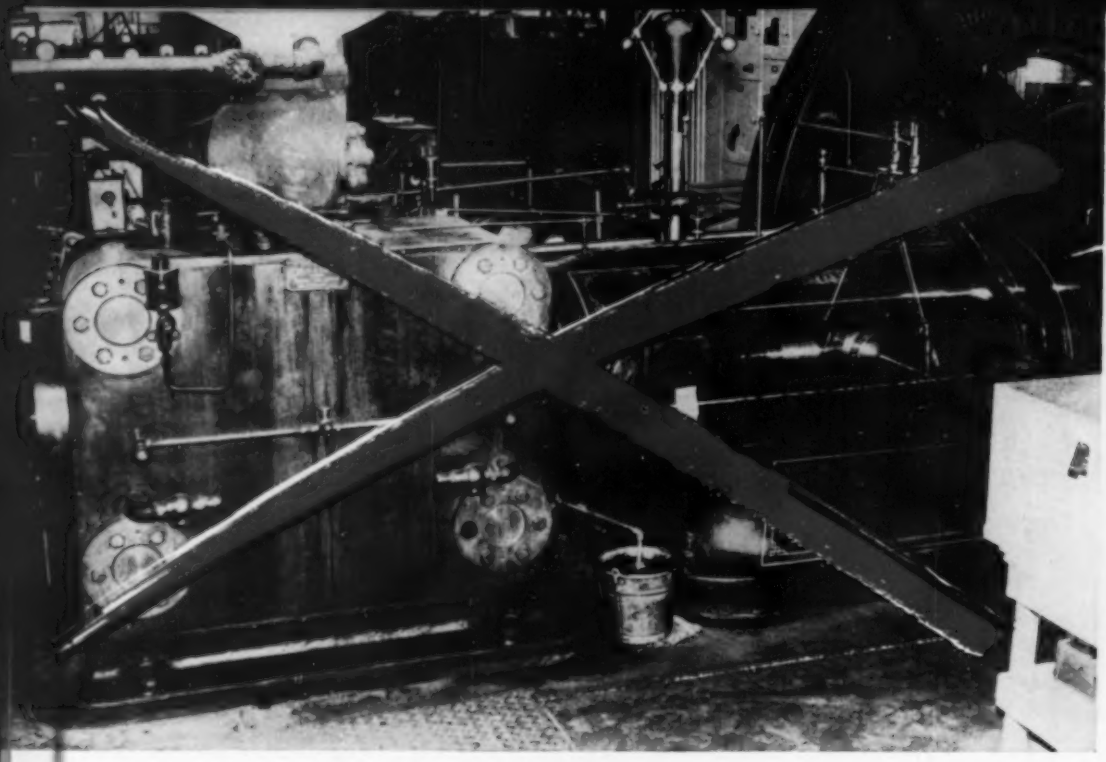
Name_____ Title_____

Company_____

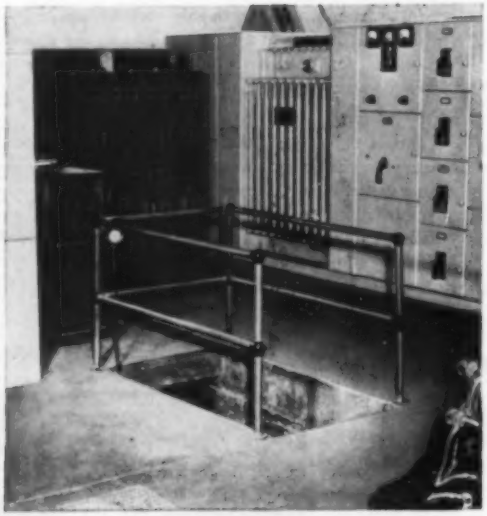
Address_____

City_____ State_____

DOW
CHEMICALS
INDISPENSABLE TO INDUSTRY AND AGRICULTURE



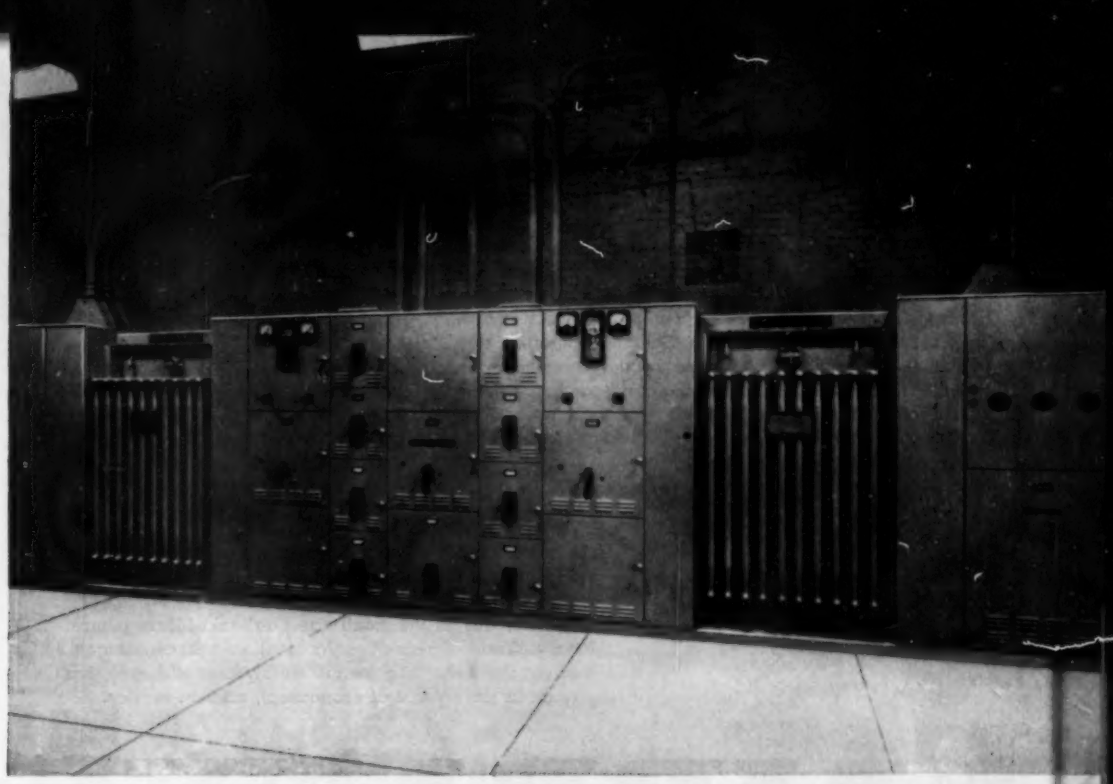
Obsolete power supply completely



G-E LOAD CENTER UNIT SUBSTATION was installed without interruption of the plant's power. Sectionalized design permitted the two-step operation in which the generator's load was thrown on one transformer before the steam engine and generator were removed.

THE STEAM-DRIVEN GENERATOR pictured above supplied much of the power used by the Illinois Cabinet Company. Rated at 500 kva, it was severely overloaded much of the time. Failures of steam, engine and generator resulted in costly shutdowns.

The company could have saved $9500 in power costs if it had been purchasing the power it generated in 1947 and 1948. In addition, it would have avoided the expense of handling 56 carloads of coal.



replaced without plant shutdown!

G-E load center system saves Illinois Cabinet Company $4500 annually—simplifies future expansion

Plagued by costly power failures and poor voltage conditions, the Illinois Cabinet Company, Rockford, Illinois, called in the General Electric Company for a complete remodeling of its power system.

In place of the old 500-kva, 240-v steam-driven generator, G-E engineers suggested a 1000-kva load center unit substation and the purchase of *all power from the local utility.* In addition, they proposed a new feeder system to simplify the existing circuits, reducing voltage drop and copper losses. Calculations showed that power costs could be cut by $4500 annually.

To minimize lost production time, the double-ended load-center unit was installed in two sections since it could not be completely assembled until the old steam engine was removed. After the first section was installed, the generator's load was thrown on the new transformer. Then the steam engine and generator were removed and the second section was fitted into place. In two week-ends the transformation was complete.

You, too, can get a power distribution system adapted to today's constantly changing production picture. See your G-E sales representative, or write for Bulletin GEA-3592 Load Center Unit Substations and GEA-5600 "Electric Power for Industry's Third and Biggest Expansion." General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

321-79

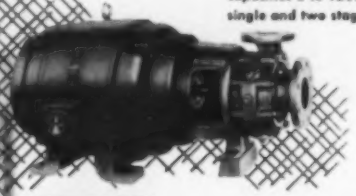
LITTLE...But Mighty Efficient

If your pump requirements call for a small to moderate size pump, you'll find the efficient, economical answer in the Fairbanks-Morse line.

Take Figure 5530 Side-Suction Centrifugal Pumps, for example. These compact, sturdy pumps are highly efficient, yet they're economical both in first and operating costs. Because Fairbanks-Morse is able to apply production line methods, with precision machining of all parts, you get the same high standards of material, workmanship and performance normally found only in highest quality split-case centrifugals.

Side-Suction Centrifugals . . . capacities 25 to 3000 g.p.m.

Builtogether Centrifugals . . . capacities 5 to 1200 g.p.m., single and two stage.



Or take Fairbanks-Morse Builtogether Centrifugals . . . the exceptionally compact units that combine motor and pump in one efficient unit. These space-savers can be installed in virtually any position.

Or take any of the small size Fairbanks-Morse pumps. Rotary, Westco Turbine Type, or small straight centrifugals. You get the same "big pump" quality and efficiency that pay off in more years of economical, efficient service.

FAIRBANKS

A NAME WORTH

BIG..But Low in Operating Costs

Where pumping requirements demand big capacity pumps, again Fairbanks-Morse can answer your needs for more efficient, economical performance.

Two-Stage, Split-Case Centrifugals, Horizontal and Vertical Angle-flow Pump, Deepwell Turbine Pumps, Vertical Propeller Pumps . . . you'll find the pump that exactly fits your needs in the Fairbanks-Morse line. Whatever the characteristics of the particular service . . . high or low head . . . capacity . . . efficiency . . . wet or dry pit . . . basic water supply, booster service . . . transfer service . . . or liquids material handling . . . you'll get the service you want at minimum maintenance and operating costs.

Horizontal and Vertical Angle-flow . . . capacities to 100,000 g.p.m.

Horizontally Split-Case Centrifugal . . . capacities to 50,000 g.p.m.

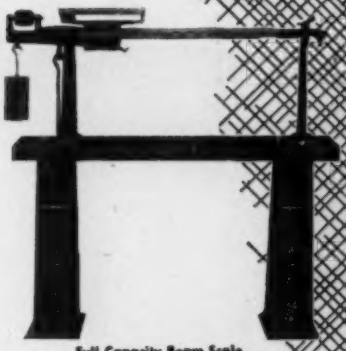
Deep Well Turbine . . . capacities to 10,000 g.p.m.

Take the WAIT Out of Weighing Whether It's a Beam Scale..

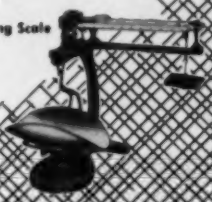
You can weigh *fast and accurately* with a beam scale . . . if it's Fairbanks-Morse. These efficient weighing instruments were designed for easy-reading and accurate weighing.

All poises on Fairbanks-Morse Beam Scales are center indicating, full open face. Large, easily readable figures on face plates are set at a 45 degree angle to assure fast, easy reading . . . regardless of the height of the weigh-man! These Fairbanks-Morse advantages mean less chance for costly human errors . . . less "waiting on weights" . . . faster operation.

Fairbanks-Morse Beams can be furnished as standard, full capacity, or as Type-Registering with weights are printed on a card for accurate records. Beam counting scales are also available to count accurately *by weight*, small parts or pieces. Counting scales save time, money and are an essential aid in accurate inventory control.



Full Capacity Beam Scale



Beam Counting Scale

Type Registering Beam Scale

-MORSE

REMEMBERING

...OR A Dial Scale

Fast, enduringly accurate Fairbanks-Morse Dial Scales speed and simplify industrial weighing wherever they are used. Basic simple design, with an absolute minimum of moving parts, assures less chance for trouble . . . less chance for inaccuracies. There is a Fairbanks-Morse Dial Scale to fit any weighing requirement. They can be equipped with Printomatic Recorders to provide an accurate printed record of weights. Consult your Fairbanks-Morse weighing expert regarding your scale needs.

Portable Dial Scale

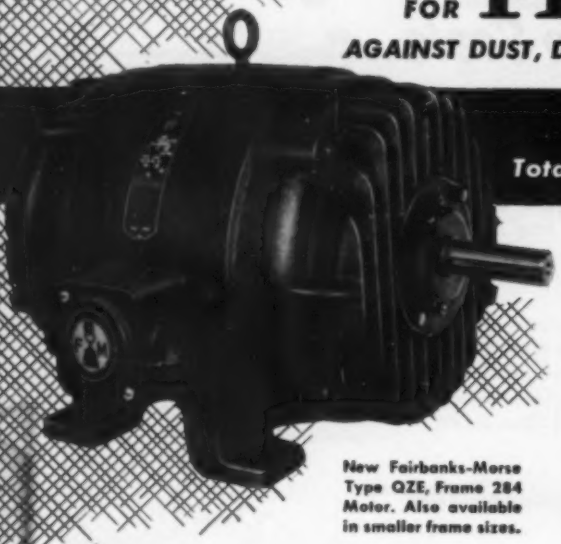
Platform Dial Scale

Bench Dial Scale

See next page for Fairbanks-Morse Sales Centers

FOR PROTECTION

AGAINST DUST, DIRT, ABRASIVES, STEAM, FUMES, ETC.



New Fairbanks-Morse Type QZE, Frame 284 Motor. Also available in smaller frame sizes.

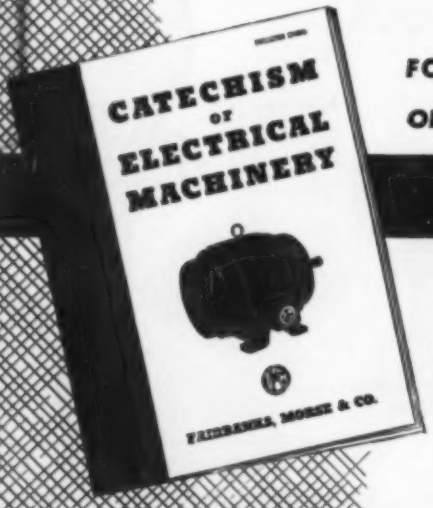
FAIRBANKS-MORSE

Totally Enclosed, Non-Ventilated Motors

For the toughest operating conditions, here is the newest development in totally enclosed, non-ventilated motors. Fairbanks-Morse Type QZE Motors are now available in Frame 284—delivering 7½ hp. at 1800 r.p.m., 5 hp. at 1200 r.p.m—filling a long-standing need for this type and size of motor. New features that assure cool, long-running service include a unique end-bell construction with cooling fins for efficient heat dissipation—and for safe, uniform, internal temperatures. For the full story on the new dependability this class of QZE Motors can bring to your most severe motor jobs, ask your Fairbanks-Morse motor representative or write Fairbanks, Morse & Co., 600 South Michigan Ave., Chicago 5, Illinois.

FAIRBANKS

A NAME WORTH



FOR INFORMATION

ON DESIGN AND USE OF ELECTRIC MOTORS

Send for This Manual!

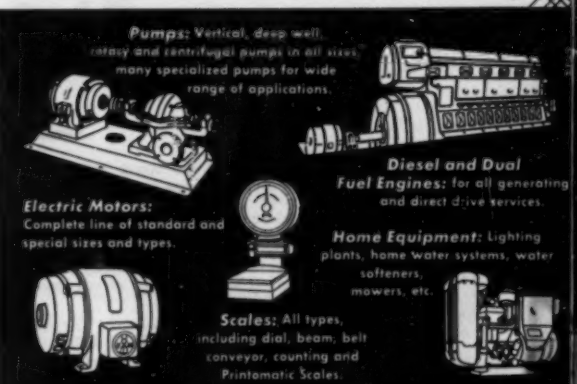
In this popular "Catechism of Electrical Machinery," you'll find an invaluable fund of basic information on the design, performance and proper use of the common types of alternating and direct current motors and generators. Primarily intended for training those who are not too familiar with electrical phenomena or terminology, it has been widely accepted by engineers, designers, and others as an aid in instruction of new men. It can be especially useful now, during this period of expanding and shifting employee rolls. Write your nearest Fairbanks-Morse Sales Center for your copy.

FOR ACTION

CALL YOUR FAIRBANKS-MORSE SALES CENTER

You can minimize procurement problems these days by depending upon your local Fairbanks-Morse Sales Center as a common source for the bulk of your requirements for electric motors, pumps, scales and diesel engines.

Fairbanks-Morse Sales Centers are staffed by factory-trained sales and service engineers who offer prompt and valuable application assistance for all Fairbanks-Morse products—as well as fast repair parts service to keep your old equipment going at top efficiency. For where to call—see the list below.


Pumps: Vertical, deep well, rotary and centrifugal pumps in all sizes; many specialized pumps for wide range of applications.
Diesel and Dual Fuel Engines: for all generating and direct drive services.
Electric Motors: Complete line of standard and special sizes and types.
Home Equipment: Lighting plants, home water systems, water softeners, mowers, etc.
Scales: All types, including dial, beam, belt conveyor, counting and Printomatic Scales.

-MORSE

REMEMBERING

THESE ARE YOUR FAIRBANKS-MORSE SALES CENTERS

ATLANTA 3, GEORGIA
760 Lee St., S. W.
AMhurst 7701

BALTIMORE 18, MD.
659 E. 25th St.
BElmont 5258

BIRMINGHAM 1, ALA.
626 N. Ninth St. Zone 4
3-6546

BOSTON 10, MASS.
178 Atlantic Avenue
LAfayette 3-3600

BUFFALO 3, N. Y.
33 Franklin St.
Lincoln 4210

CHARLOTTE 2, N. C.
Liberty Life Bldg.
Room 605
6-2893

CHICAGO 5, ILLINOIS
1550 S. State St.
HArrison 7-7100

CINCINNATI 2, OHIO
49 Central Avenue
MAin 3010

CLEVELAND 14, OHIO
3000 W. 117th St.
CLearwater 1-3300

COLUMBUS 8, OHIO
1034 Goodale Blvd.
WAlnut 8581

DALLAS 2, TEXAS
1713 N. Market Street
CEntral 4347

DENVER 2, COLO.
1500 17th Street
TAbor 6241

DES MOINES 17, IOWA
2017 Dean Avenue
6-1189

DETROIT 13, MICHIGAN
11110 East Warren Ave.
VAlley 1-7100

DULUTH 2, MINN.
Board of Trade Bldg.
2-7538

HOUSTON 13, TEXAS
5521 Navigation Blvd.
WAyside 2159—(LD 506)

INDIANAPOLIS 2, IND.
1499 N. Harding St.
FRanklin 3684
ATlantic 3092

JACKSONVILLE 6, FLA.
930 East Adams St.
3-6473

KANSAS CITY 7, MO.
1300 Liberty Street
Victor 6474

LOS ANGELES 11, CALIF.
4535 S. Soto Street
JEfferson 8151

LOUISVILLE 8, KY.
2008 So. Brook St.
CAlhoun 1469

MEMPHIS 7, TENN.
676 Jefferson Ave.
5-1614

MILWAUKEE 3, WIS.
404 N. Plankinton
DAly 8-0180

MINNEAPOLIS 15, MINN.
417 S. Fourth Street
MAin 4353

NEW ORLEANS 13, LA.
1000 St. Charles Ave.
RAymond 3115

NEW YORK 4, N. Y.
80 Broad St.
HAnover 2-7470

OMAHA 8, NEBRASKA
902 Harney St.
ATlantic 3122

PHILADELPHIA 8, PA.
401 N. Broad St.
WA 2-4100

PITTSBURGH 24, PA.
4301 Main Street
SChenley 1-3123

PORTLAND 14, OREGON
105 S. E. Taylor St.
EAst 0131

PROVIDENCE 3, R. I.
187 Pine Street
GAspee 1-1531

ST. LOUIS 2, MO.
217 South Eighth St.
CHestnut 7483

ST. PAUL 1, MINN.
220-26 E. Fifth Street
GArfield 4335

SALT LAKE CITY 1, UTAH
153 W. Second South St.
3-2108 & 3-5139

SAN FRANCISCO 7, CALIF.
630 Third Street
EXbrook 2-5855

SEATTLE 99, WASH.
Salmon Bay Terminal
ALden 6600

STUTTGART, ARK.
403 South Main St.
185

TULSA 3, OKLA.
1335 Hunt Bldg.
3-8231

WASHINGTON 5, D. C.
1000 Vermont Ave., N. W.
District 6694

FAIRBANKS-MORSE de MEXICO S. A.
Balderas 146, Mexico 1, D. F. Mexico
10 06 74 y 10 09 58

Export Division:
NEW YORK 4, N. Y.
80 Broad Street—HAnover 2-7470

TYGON

Versus HNO_3

NITRIC acid on the attack is hard to stop. However, there are good defenses available and one of the best is the versatile group of TYGON plastic compounds. Properly used, TYGON—as tank lining, gasketing, flexible piping, or protective coating—displays excellent resistance to nitric acid over a useful range of concentrations and conditions.

Essentially, TYGON consists of selected polyvinyl resins skilfully modified with other materials to give the optimum in chemical resistance and desirable physical properties. Solid TYGON is available in calendered, extruded, or molded form. Liquid TYGON is available as a plastisol or as a solvent type paint. Such variety in form permits the best use of TYGON for a specific application.

In calendered form, TYGON is generally used as a material of construction. Volume use is as a lining for tanks and tank covers, drums, hoppers, fume hoods, and fume ducts. Widest use is as cut gaskets and washers for sure, durable seals in all types of chemical process equipment. As a 3/32" calendered sheet, TYGON resists nitric acid in concentrations up to 30% by weight and temperatures as high as 150°F. Permissible concentration depends upon the temperature of service, with only the lower strength solutions being advised for the higher temperature. When cut into gaskets, calendered TYGON can be used with practically any concentration of the acid as the slight swelling and other changes that take place in the small exposed area serve only to make a tighter seal and have very little effect on the protectability or functioning of the entire gasket. Either as sheet or gasket, TYGON is not recommended for service with mixed or nitrating acids without previous consultation with U. S. Stoneware engineers.

In extruded form, TYGON is used primarily as a medium of transmission. However, extruded solid cord, channel, or tape are also used as materials of construction.

Smooth walled, light weight and flexible, TYGON Tubing, in sizes up to 2" ID, is used in a great number of laboratories and plants for the safe, efficient transmission of liquids, gases and semi-solids. In many plants, TYGON is being used as flexible piping in permanent or temporary transfer lines, as flexible connections, as line desurgers, as ports on chemical pumps and filters, or as syphon hoses.

As tubing, TYGON is resistant to nitric acid in any concentration and at temperatures up to 130°F. For brief, intermittent exposures, the temperature limit can be increased to 150°F. However, in any service with nitric acid, the life of TYGON Tubing is directly dependent upon the length of exposure and the care given the tubing. Short periods of service and frequent cleanings are suggested. The counsel of our engineers is recommended.

In molded form, TYGON sees service as gaskets, grommets, washers, stoppers, handles, bumpers and special fittings. Where necessary, it can be reinforced with glass fibers for added strength. With or without reinforcement, molded TYGON generally is suitable for service with nitric acid of any concentration and temperatures as high as 150°F. Specific limitations depend upon the size and design of the piece, the temperatures and pressures involved, and other conditions of service. Use with mixed or nitrating acids is not advised without consultation.

As a paint, TYGON, in contact with nitric acid, must be considered in the light of the limits of a thin film. Generally, a TYGON paint film is resistant to the fumes of nitric acid in all concentrations and up to 150°F. However, contact with highly concentrated hot nitric acid is to be avoided and any spillage, regardless of concentration, should immediately be washed off. The minimum system recommended for any service with nitric acid consists of a primer and no less than five top coats.

As a plastisol, TYGON finds use as a heavy duty coating and in the casting or "slush" molding of flexible fittings and parts. For coating work, it can be applied by dipping or spraying on hot metal, and, then, fusing. Resistance to nitric acid varies, depending upon the thickness of the coating deposited.

In any of its forms, TYGON provides low cost protection and high degree of safety in the handling of not only nitric acid and related chemicals, but a wide range of other acids, alkalies, oil, greases and water.

TYGON plastics

In addition to TYGON in its various forms, we also manufacture a number of other materials capable of handling nitric acid in any concentration and under all types of operating conditions. These products include chemical stoneware and porcelain, acid proof brick and cements, and other organic linings and coatings.

Why don't you submit your corrosion problem, today? There's no obligation and we'll be pleased to be of assistance. So write, now! 223c

THE UNITED STATES STONEWARE CO., Akron 9, Ohio

ENGINEERS, MANUFACTURERS, ERECTORS OF CORROSION-RESISTANT EQUIPMENT SINCE 1865

THE Chementator

Reg. U.S. Pat. Off.

Prepared under the editorial direction of Joseph A. O'Connor, News Editor

Titanium gets a job in cobalt refining

Commercially pure titanium metal is being used by Chemical Construction Corp. for the fabrication of special autoclaves to be used in its new process for refining cobalt. Howe Sound Co. will employ the Chemico process at its Garfield, Utah, cobalt refinery, which is now under construction.

Petrochemicals: only the beginning

A decade of continuous expansion, with increases in production up to 1,000 percent by 1962 for some cinderella chemicals, is foreseen for the fabulous petrochemical industry by Dr. Wayne E. Kuhn, technical research manager of the Texas Co. "The petrochemical revolution has barely begun," he says.

This relatively new American industry, which grew from a $350 million business to a $1.25 billion one in its first decade, will be worth more than $5 billion ten years from now; its production will have increased from today's 16 million pounds annually to about 64 million, Kuhn estimates.

"Today," he points out, "about 25 percent of all chemicals being made in the United States are petrochemicals. During the next decade the figure will increase to more than 50 percent."

A growth of more than 250 percent in the production of ethylene by 1962 is forecast by Kuhn. He expects annual output of ethylene to be close to 4 billion pounds by then.

Petrochemicals derived from ethylene will vary in their growth, according to Kuhn, with polyethylene, which "will soon become the most important plastic in terms of pounds produced," increasing 1,000 percent to 550 million pounds a year by 1962.

Despite this growth of petrochemical manufacturing, its raw material demands will be but a drop in the oil industry's bucket. "Less than 1 percent of our yearly production of petroleum suffices for today's petrochemicals. This will be enough for some time to come," says Kuhn.

Making chemicals is not the same as oil refining, however, as Kuhn is quick to warn. Some pitfalls for unwary producers of petrochemicals: the critical relationship of plant size to production costs, plant investment costs ("because of size the per-barrel petroleum investment requirement is only one-third that of the petrochemical industry"), the utility needs of petrochemical processing, the high cost of transporting chemicals to market and the greater cost of research.

Refiners help to close sulphur gap

The U. S. petroleum industry this year will produce 5,500 tons more sulphur than it will use in its own operations, according to Petroleum Administrator Bruce K. Brown. And by the end of 1952, he estimates, refiners will be recovering 196,000 long tons a year more than they will need.

Petroleum refineries will require an estimated 638,000 long tons of sulphur for fresh sulphuric acid this year. But Brown says the industry will release 643,500 tons through its own operations to provide the 5,500 ton surplus.

Right now, refineries are just about breaking even in the sulphur scramble. And even with the surplus in sight, PAD is urging NPA not to cut sulphur allotments to oil producers.

Another way to make ammonium sulphate

To beat the sulphuric acid shortage, Phillips Chemical is thinking about switching to a German process at its ammonium sulphate plant on the Ship Channel at Houston.

Ammonia will be carbonated with carbon dioxide to form ammonium carbonate. This will be reacted with a slurry of calcium sulphate, forming calcium carbonate and ammonium sulphate. Phillips will get the calcium sulphate as a byproduct from a continuous triple superphosphate plant it plans to build.

MCA wants Capehart amendment kept

While ostensibly intended to clarify the Capehart amendment to the 1951 Defense Production Act, S-2092 would actually deprive manufacturers of their right to adjust prices to cover increased costs, both direct and indirect, incurred up to July 26, 1951. That's the charge brought against the proposed revision by the Manufacturing Chemists' Association, which wants the Capehart amendment retained. The Office of Price Stabilization claims that the Capehart amendment is unworkable, wants it changed.

But John A. Sargent, executive vice president of Diamond Alkali, thinks otherwise. Representing the MCA, he recently told members of a Senate banking

(*Continued on page 104*)

and currency subcommittee, "All OPS has to do to put the Capehart provisions into effect is to issue a simple amendment to existing regulations." And he emphatically doesn't mean S-2092. Passage of that bill, Sargent warned the senators, could wipe out rights of manufacturers to equitable price ceilings. He thinks that a properly drafted regulation would make it easy to administer the Capehart provisions.

Synthetic rubber: at a slight increase

Price of GR-S, which the government sells to industry at cost, has been hiked from 24½ to 26 c. a lb. Reason: boosted production from higher-cost alcohol butadiene. All price controls have been taken off butadiene for making synthetic rubber, whether the butadiene comes from petroleum or non-petroleum sources.

To get production of synthetic rubber up to 860,000 tons a year, the RFC will, among other things, expand alcohol butadiene production until 31 percent of all GR-S comes from it. It costs 37 c. a lb. to make synthetic rubber from alcohol butadiene, compared with 12 c. for that made from petroleum butadiene. Rising output of butadiene from petroleum eventually may cause the price of GR-S to come back down.

The government has about $500 million invested in its 29 synthetic rubber plants. Most of the output is GR-S, the butadiene-styrene copolymer, with butyl rubber, known as GR-I, making up the rest. The price of butyl remains unchanged. RFC sells both GR-S and butyl rubber to about 800 private purchasers, principally for use in tires and tubes.

Currently, the value of the synthetic rubber produced each day in the government-owned plants comes to more than $1 million. And more will be made: new processes and increases in plant will bring capacity to over 1 million tons a year.

Hassle over rubber plants

President John L. Collyer of Goodrich wants the government, after the present emergency, to "desocialize" the rubber industry by selling or leasing the plants it now owns. The present rubber act will expire at the end of June in 1952.

As a result of two wars within a decade, Collyer points out, the government owns the plants, procures the raw materials and schedules production. It is the only buyer and importer of crude rubber, determines how much rubber a manufacturer can use, specifies uses of rubber and fixes the price.

Today, Collyer declares, a crude rubber stockpile big enough to meet the nation's military and essential civilian requirements for a five-year war has been accumulated. And the nation's reactivated and expanded synthetic rubber industry can now produce over 1 million long tons a year. So it is high time, he urges, for the government to get out of the rubber business and give it back to competitive private enterprise.

Even so, Collyer wants the government to retain its responsibility for maintaining the strategic stockpile of crude rubber. In addition, he proposes that the government stockpile 200,000 long tons of synthetic rubber. But he doesn't want these stockpiles used to manipulate rubber prices.

Denying Collyer's charge that the rubber industry is "socialized," RFC Administrator W. Stuart Symington says the government is considering the sale of the 29 plants it now owns.

Private companies currently operate synthetic rubber plants for RFC on a fee basis, Symington adds. But he concedes that the fee may be less than "fair profits" if the plants were privately owned, as the price of synthetic rubber might then be higher. However, he thinks processing developments will lower production costs no matter who owns the plants.

Not moonshine, but petrochemicals

First units at the liquid hydrocarbon recovery plant of Tennessee Gas Transmission near Gabe, Ky., are getting into limited production. Production will be stepped up later this year as other units are completed and the new $17 million chemical plant of Mathieson Hydrocarbon Chemical Corp., 58 miles away at Brandenburg, Ky., hits full stride. It's already in partial production.

When in full operation, the stripping plant of Tennessee Gas will process about 750 million cubic feet of natural gas daily, getting about 380,000 gal. of liquid hydrocarbons from it. About 16 percent of the ethane will be extracted from the gas and substantially all the propane, butanes, hexanes and heavier hydrocarbons.

The liquid hydrocarbon stream will be pumped in an 8-in. line to the plant of Mathieson Hydrocarbon at Brandenburg, where it will be fractionated into ethane, propane, butanes and natural gasoline.

Ethane will go to the cracking furnace for conversion into ethylene and other gases. Ethylene will be used to produce ethylene oxide, ethylene glycol and other chemicals. Byproducts will include propane, butanes and natural gasoline.

Big expansion for Heyden

To finance a major expansion program, Heyden Chemical will issue 53,300 shares of convertible second preferred stock with no par value. Proceeds of the stock sale will exceed $5 million.

The new capital will be used to carry out the expansion program now under way to double production of antibiotics at Princeton, N. J., and to increase pentaerythritol capacity at Garfield, N. J., and Fords,

(*Continued on page 108*)

Now serving your needs as

COLUMBIA-SOUTHERN CHEMICAL CORPORATION

You've known these familiar trademarks . . .

NOW LOOK FOR THIS TRADEMARK

to assure the same high quality in alkalies and related chemicals...

You can rely on the same experienced organization

Whether you've been accustomed to doing business in the past with Columbia Chemical Division of Pittsburgh Plate Glass Company, or with Southern Alkali Corporation, you'll continue to find the same competent personnel —in every department—welcoming the opportunity to serve you as Columbia-Southern . . . through strategically located plants and offices.

Production at all plants is being maintained at the highest possible levels in order to help meet the current requirements of industry. And the same district offices will continue to provide facilities that assure the most careful attention to the needs of your business.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION

SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY

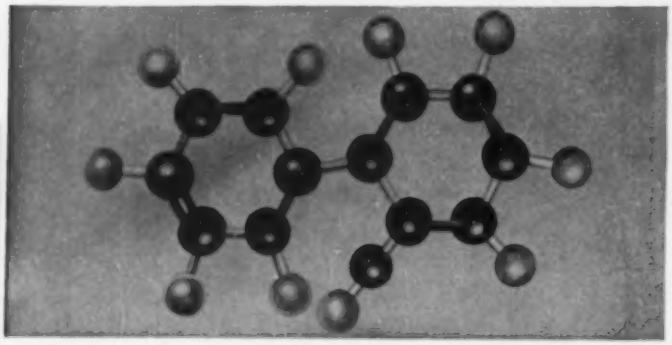
EXECUTIVE OFFICES:
Fifth at Bellefield, Pittsburgh 13, Pa.

PLANTS: Barberton, Ohio • Bartlett, California • Corpus Christi, Texas • Lake Charles, Louisiana • Natrium, West Virginia

DISTRICT OFFICES: Boston • Charlotte • Chicago • Cincinnati • Cleveland • Dallas • Houston • Minneapolis • New Orleans • New York Philadelphia • Pittsburgh • St. Louis

MONSANTO
CHEMICALS – PLASTICS

These useful Monsanto intermediates available for immediate delivery

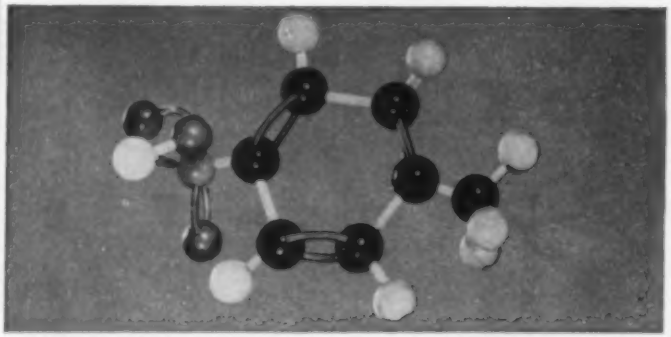


ortho-Phenylphenol

Ortho-phenylphenol, technical, available now from Monsanto, has numerous possibilities in addition to its present uses. In this day of shortages, it may be the answer to some of your problems.

Typical Analysis

Appearance and Color...Light tan-white solid
Crystallizing Point.....50.6° C.
% Ortho P.P. (from Cryst. Pt. Curve)....95.2
Phenol (from Cryst. Pt. Curve).....4.8
First Drop.....277° C.
50%.....288° C.
Dry Point.....289° C.

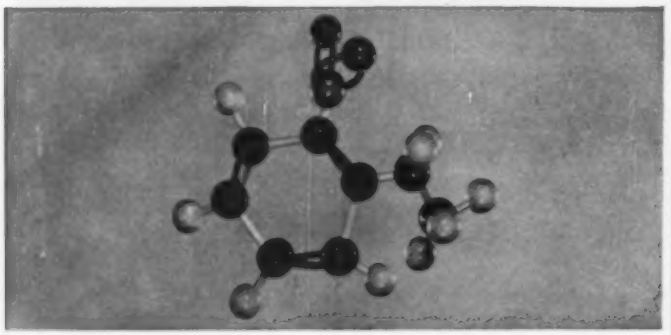


Toluenesulfonic Acid

If you need toluenesulfonic acid, technical, get in touch with the nearest Monsanto Sales Office. Monsanto can give you prompt service on this chemical. It's used as a dyestuff intermediate and as a catalyst in certain organic reactions.

Typical Analysis

Appearance and Color.....Greenish to black viscous liquid or semicrystalline solid
Molecular Weight.....172.20
Toluenesulfonic Acid.....94.0% min.
H_2SO_4.....1.0% max.
Water.....2.0% max.
Toluene.....0.2% max.
Para Isomer.....80.0%
Ortho Isomer.....20.0%



ortho-Ethylnitrobenzene

In Monsanto's available ortho-ethylnitrobenzene, you may find the solution to some of your troubles with chemical shortages.

Approximate Properties

Molecular Weight.....151.1
Appearance.....Yellow to green, clear liquid
Assay.....99-100% (including approx. 4% to 6% para isomer)
Boiling Point.....About 228° C.
Crystallizing Point..About −12° to −14° C.
Refractive Index at 25° C.....1.53
Solubility....Miscible in most organic solvents, immiscible in water.
Specific Gravity at 25°/25° C.....1.1

Low-cost HB-40 can help you solve plasticizer problem

Regardless of your supply situation on plasticizers, take a look at Monsanto's HB-40. HB-40 is available . . . low in price . . . an excellent coplasticizer or plasticizer extender in vinyls.

HB-40 (partially hydrogenated terphenyl) is practically colorless and, properly stabilized, performs excellent service in clear and pastel-shaded films. It is practically free of toxicity and odor.

HB-40 reduces costs without sacrificing quality when employed as a coplasticizer or as an extender for primary plasticizers in vinyl extrusions, vinyl pastes, vinyl slush moldings and in both supported and nonsupported vinyl films and sheetings.

The amount of HB-40 that can be used varies from 20% to 50% based on the total weight of plasticizer in the formulation. The amount to be employed depends on the specific formulation, the type of processing and the end use of the finished vinyl plastics.

For complete technical information on Monsanto HB-40, contact the nearest Monsanto Sales Office or mail the coupon for a copy of Monsanto Technical Bulletin No. P-104.

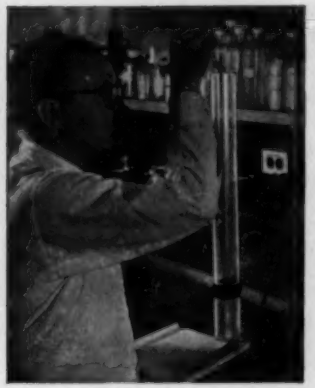
Monsanto expands research work in rubber chemicals

Monsanto, a leader in rubber chemicals research and manufacture for more than three decades, is expanding its laboratories at Nitro, W. Va. The new facilities will be in operation in 1952. They will almost double space available for rubber research activities. Research staff will be substantially increased to undertake new research in rubber chemistry.

Monsanto's chemicals for the rubber industry include antioxidants, accelerators, wetting agents, detergents, colors, reodorants and a number of special materials. Mail the coupon for information on Monsanto rubber chemicals and rubber laboratory service.

Monsanto AE-1, efficient defoamer, has possibilities in many processes

Without AE-1



With AE-1

Monsanto AE-1, a new, high-molecular-weight alcohol-ester, has proved its efficiency as a defoamer. It has been used effectively in several other applications and has many unexplored possibilities. AE-1 is priced for economy and it is available in any quantities you need.

Defoamer

As a defoamer, AE-1 is efficient and economical and is effective even at low pH ranges. It has found application as a capable defoamer in the following:

In ethyl alcohol production from molasses, 4 parts per million, added at the fermenter, controls foam.

In yeast manufacture, and in other fermentations, 50 to 500 ppm. of AE-1 ends the foam problem.

In polystyrene latex water dispersions, foam is kept in check by 0.5% to 1.5% of AE-1.

Lubricant for Vinyls

Good lubricity for extruding or calendering vinyls results from the addition of 2% of AE-1, based on the resin.

Plasticizer

AE-1 is an excellent coplasticizer for rubber hydrochloride and chlorinated rubber. It is compatible with nitro cellulose and other cellulosic derivatives.

Antiblooming Agent

Used in pentachlorophenol wood preservative formulations, AE-1 is an effective antiblooming agent. It dissolves 25% by weight of Penta at 25° C. AE-1 increases the solubility of Penta in wood-preserving formulations.

Physical and chemical characteristics of Monsanto AE-1 indicate numerous other applications in industry. If you would like to do some exploring on the use of AE-1 in your business, mail the coupon for a copy of Monsanto Technical Bulletin No. P-140. And write for free sample for your evaluation.

• • • • • • •

MONSANTO CHEMICAL COMPANY, 1700 South Second Street, St. Louis 4, Missouri. District Sales Offices: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY... WHICH SERVES MANKIND

SEND INFORMATION:
- ☐ ortho-Ethylnitrobenzene
- ☐ ortho-Phenylphenol
- ☐ Toluenesulfonic Acid
- ☐ Rubber Chemicals and Laboratory Service

SEND LITERATURE:
- ☐ Bulletin P-104 (HB-40)
- ☐ Bulletin P-140 (AE-1)

MONSANTO CHEMICAL COMPANY
1700 South Second Street, St. Louis 4, Missouri

Please send, without cost or obligation, information or literature as indicated at the left.

Name.....Title.....

Company.....

Street.....

City.....Zone.....State.....

N. J. One of the largest producers of antibiotics, Heyden also pioneered production of pentaerythritol. Heyden will also expand output of toluene derivatives and specialty products at Garfield and Fords.

Another Alamo to remember

Whopping project granted a fast tax writeoff of 50 percent by DPA calls for construction, at a cost of over $38 million, of a plant in the Houston area to produce ammonia, methanol and acetylene. Alamo Chemical Co. has been organized to undertake the venture.

Phillips Chemical filed the application with DPA in Washington. Decision to build this plant came after long discussions by officials of General Aniline & Film, the Borden Co. and Phillips.

Improved nitric acid process

Bamag-Meguin of Germany has developed an improved Fauser process for manufacture of nitric acid by oxidation of ammonia with pure oxygen. Either 60 percent acid, for conversion into sodium nitrate, ammonium nitrate, calcium ammonium nitre and ammonium sulphate, or 98 percent acid can be produced without using sulphuric acid. General Industrial Development Corp. of New York is handling the process in the United States.

Use of pure oxygen instead of air in the conversion of ammonia and in oxidation of nitric oxide and dioxide means a more compact, and hence less expensive, plant. Operating costs are lower too. The improved Fauser process should be a natural for places where cheap oxygen can be secured.

Pyridines: their synthesis pays off

MORE COMING—Watch for a breakout in production of pyridines. Its impetus will come from synthetic processes. Demand now outstrips supply, and production from coal is at its peak. In the future, most pyridines may come from petroleum. It's all part of the trend from coal to petroleum as a source of aromatics. And right now a lush new market in synthetic fibers, plus the growing one in pharmaceuticals, is luring makers of chemicals into production of pyridines.

NEW PRODUCERS—Carbide & Carbon at Institute, W. Va., is building a plant to produce millions of pounds a year of methyl ethyl pyridine. Phillips Chemical will erect a $3 million plant on the Houston Ship Channel to make methyl ethyl pyridine and 2 million pounds per year of methyl vinyl pyridine. Byproducts from the Phillips plant, totaling about 1 million pounds per year, will include mixed pyridines, lutidines and picolines. Both the Carbide and the Phillips plant are expected to be running next year.

Meantime, Nepera Chemical Co., big producer of niacinamide, which is made principally from pyridine, is already producing methyl ethyl pyridine at its Harriman, N. Y., plant. It's used instead of pyridine in the synthesis of niacinamide, a member of the vitamin B complex. And Reilly Tar & Chemical expects to be turning out synthetic pyridine in volume by 1953.

PROCESSES—Acetaldehyde and ammonia are the starting materials in these new processes for making methyl ethyl pyridine. That compound can be converted to alkyl vinyl pyridines. These, in turn, might be dealkylated to form vinyl pyridine.

In its process, Phillips will first polymerize acetaldehyde to paraldehyde, next dehydrogenate, then react with ammonia, and finally purify the product.

Methyl ethyl pyridine can also be oxidized to the dicarboxylic acid, which is readily decarboxylated to give nicotinic acid, otherwise known as niacin, of which Merck and Barrett are now the biggest producers.

MOUNTING DEMAND—Even though present U. S. production of 2 deg. pyridine is about 2 million pounds per year, demand outstrips supply. Today, pharmaceuticals take 40 percent of all pyridine produced. Reason: climbing output of sulfa drugs, antihistamines, and niacin and niacinamide. Production of niacin, currently bottlenecked by scarcity of quinoline, can be stepped up by making more of it from synthetic methyl ethyl pyridine.

Offsetting the clamor of pharmaceutical manufacturers for pyridine, however, is the fact that by early next year Nepera Chemical, which up to now has taken about one-third of all U. S. pyridine output, will be out of the market, thanks to its new synthesis of niacinamide from acetaldehyde and ammonia via methyl ethyl pyridine.

But the newest market for pyridines is in synthetic fibers. Vinyl pyridine and alkyl vinyl pyridines can be used to make synthetic fibers easier to dye. Synthetic fibers will take much of the output of the new Carbide and Phillips plants. Both Chemstrand and Du Pont are likely customers. In fact, Du Pont, which is the second largest stockholder of Phillips, will use vinyl derivatives of pyridine from the new Phillips plant in its synthetic fiber Orlon. And this new market for pyridines will grow. By 1953, for example, this single use in man-made fibers may take as much as 5 million pounds a year of vinyl pyridine alone.

Oil men enter phosphate business

A certificate of necessity has been granted to Texas City Chemicals, Inc., managed by a group of Texas oil men, for a phosphate rock acidulating plant on a 50-acre site at Texas City.

According to S. A. Winfrey of Dallas, vice president and general manager of the enterprise, the new plant will get 400 tons per day of 50 percent sulphuric

(*Continued on page 110*)

Saving weight and space was vital in the building of this vacuum tank truck—used to pump and haul away mud, water and waste oil from sump holes at drilling wells and refineries. Speedaire helped solve that problem. Photo courtesy of Associated Oil Co. of California.

SPEEDAIRE on sump truck saves $315

POWER is transmitted from the engine to the vacuum pump of this oilfield sump truck by a Speedaire unit. For this special job, a fan-cooled speed reducer is ideal. It affords a 3-way saving: it saves 650 pounds, or 54% of the weight; saves 6.1 cubic feet, or 61% of the space occupied; saves $315, or 34% of the initial cost of a conventional worm-gear drive.

Speedaire is Cleveland's fan-cooled worm-gear speed reducer. Because it is fan-cooled, Speedaire does more work—delivers up to *double the horsepower* of standard worm units of equal frame size, at usual motor speeds. It can be installed economically on many applications where other types have been used heretofore—giving you the advantage of a compact right-angle drive. Speedaire gives the same long, trouble-free service characteristic of all Clevelands.

For full description, send for Catalog 300. The Cleveland Worm & Gear Co., 3273 E. 80th St., Cleveland 4, O.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication.
In Canada: Peacock Brothers Limited.

CLEVELAND
Worm Gear
Speed Reducers

acid from Carbide & Carbon, fortify this and use it to treat 200 tons a day of Florida phosphate rock.

The project will cost $4.5 million, excluding operating costs and costs of the land. Chemical Construction Corp. will build the phosphate plant.

Stauffer's new citric acid process

When it starts making citric acid at its new Callender, Calif., plant Stauffer Chemical will use a new technique of accelerated molasses fermentation. The process will make possible recovery of byproducts.

Construction, now under way, was delayed four months while Stauffer waited for the go-ahead from NPA, only to learn that its foresighted purchase and warehousing of critical materials will keep current purchases below quantities requiring NPA approval.

The plant will consist of three major production units. These buildings will house air-conditioned fermentation chambers, finishing facilities and seed preparation laboratories. Completion is expected late this fall.

Since climatic conditions are all important, records of temperature and humidity covering many years were fine-combed and test runs made to find the best possible location for the citric acid plant. Proximity to western producers of beet sugar molasses, in particular to Union Sugar at Betteravia, was another decisive factor in selecting the plant site. Lying mid-way between Los Angeles and San Francisco, the 85-acre site is about eight miles south of Pismo Beach.

It took years of research and design work to develop the new accelerated fermentation process. A pilot plant was operated from 1948 to 1950. Newell Davies, who has been in charge of Stauffer's citric acid process during its development, will manage the new California plant.

New way to electroplate aluminum

A new process for electroplating aluminum has just been disclosed to members of the Electrochemical Society meeting in Detroit by Dwight E. Couch and Abner Brenner of the U. S. Bureau of Standards. The plating bath consists of an ethyl ether solution of aluminum chloride that contains either lithium hydride or lithium aluminum hydride.

The bath is operated at room temperature and at current densities up to 5 amp. per sq. dm. Anode and cathode efficiencies are about 100 percent. While the bath is not highly sensitive to moisture, hydride must be added from time to time to replace that decomposed by moisture.

Apparently the compound causing the aluminum to deposit must be a complex of the hydride, the aluminum chloride and the ether, since all three must be present to give good deposits. Conductivity measurements tag a lithium aluminum chloride ion as the current carrier.

Aluminum so deposited usually has a smooth matt finish and is quite ductile. With periodic reverse current, smooth deposits 1/32 in. thick may be applied. Hardness of the deposits varies from 37 to 97 vickers. Harder deposits are fine-grained and brittle, while softer ductile deposits have a columnar structure.

Two atomic jobs for Cyanamid

American Cyanamid has signed two non-profit contracts with AEC. One calls for research to find new ways of getting uranium from its ores; the other, for operation of a plant to recover nuclear fuel from used reactor fuel elements.

Under terms of the contract for research on uranium recovery, Cyanamid is operating a mineral dressing laboratory at Watertown, Mass. In addition to conducting research to find new ways to recover uranium, the laboratory will help present processing plants to improve their recovery techniques. About 60 persons are already employed on the project, and more will be at work by the end of the year. Cyanamid got the job because since 1922 it has been a leader in developing techniques for mineral dressing. It has done work on virtually every kind of ore.

Under terms of the other contract, Cyanamid will operate a chemical processing plant at AEC's reactor testing station near Idaho Falls, Idaho, to recover nuclear fuel from used reactor fuel elements. Cyanamid was picked from more than 20 firms considered for this job, is now winding up the recruiting of a staff, more than 70 percent of which will be scientists and technicians. The recovery process and plant design were developed by Oak Ridge National Laboratory. The architect-engineering contract was awarded to Foster Wheeler.

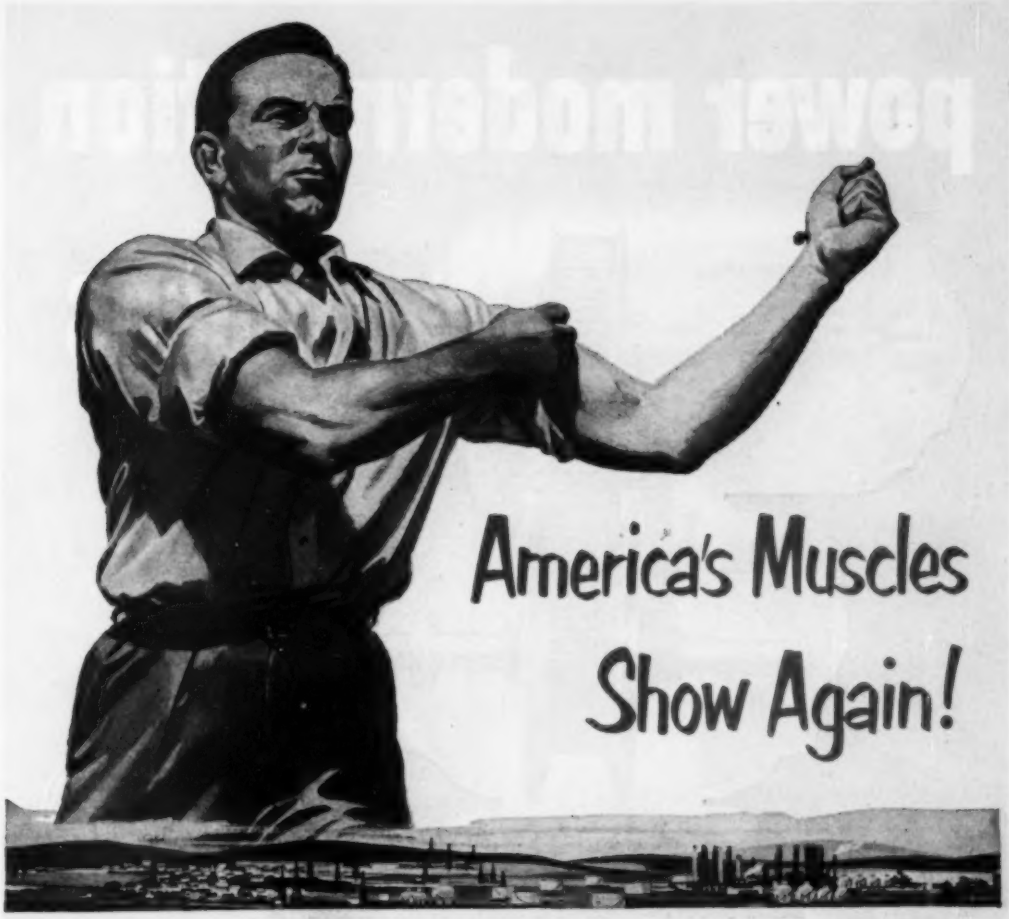
Dr. R. C. Swain, Cyanamid's vice president in charge of research and development, heads the company's recently organized Atomic Energy Division, set up to coordinate all the company's activities for AEC.

Pfizer fills the kitty

Of the 444,015 shares of new common stock recently offered by Pfizer, 439,383 shares were purchased through exercise of common stock subscription rights. The remaining 4,632 shares were purchased by an underwriting group headed by F. Eberstadt & Co., Inc.

Sale of the new common stock was the final phase of the company's financing program. The other phase involved the sale to the public of 150,000 shares of new 4 percent cumulative second preferred of $100 par value, also underwritten by F. Eberstadt & Co., Inc., and associates. As a result of the entire financing program, Pfizer has acquired $29 million of new capital.

—End



America's Muscles Show Again!

Industry's needs grow bigger by the hour. From every quarter comes the cry: "More steel . . . more oil . . . rubber . . . paper . . . textiles!" The same is true of Agriculture, for a hungry world awaits.

The task is tough. To meet it, America's chemical manufacturers are bearing down with brains and sweat . . . again working to perform the miracles of production which make our Nation's might.

For its part, General Chemical is turning out greater tonnages of vital basic chemicals upon which industry and agriculture depend so heavily.

Our every resource is committed to the job. You'll see it reflected in the output of our 34 producing works, which are meeting problems of raw material shortages and unprecedented demand. You will find it in the intelligent help of our sales and technical service men, wherever you need them.

General Chemical
Products for Industry
ACIDS • ALUMS • SODIUM COMPOUNDS • PHOSPHATES • FLUORINE DERIVATIVES • OTHER HEAVY CHEMICALS • REAGENTS FINE & SPECIAL CHEMICALS

General Chemical
Products for Agriculture
DDT • BHC • PARATHION LINDANE • ARSENICALS FUNGICIDES • OTHER ORGANICS & INORGANICS

BASIC CHEMICALS
GC
FOR AMERICAN INDUSTRY

GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

power modernization

means

perfect
speed
control

Ask for your copy of pictorial bulletin No. B-53, showing Sterling Electric Power Drives Turning The Wheels of Industry.

STERLING SPEED-TROL

...GIVES YOU VARIABLE SPEED CONTROL NECESSARY FOR:

PROCESS CONTROL OF: Temperature — viscosity — level — pressure — flow — etc.

TIME CONTROL OF: Baking — drying — heating — cooking — pasteurizing — soaking — chemical action — etc.

EQUIPMENT ADAPTATION TO: Load variation — sequence synchronization. Size — tension — hardness or shape of materials to be processed — machined — conveyed — blended — mixed — etc.

VARIATIONS IN: Quality — quantity — operators' abilities — etc.

OUTSTANDING FEATURES:

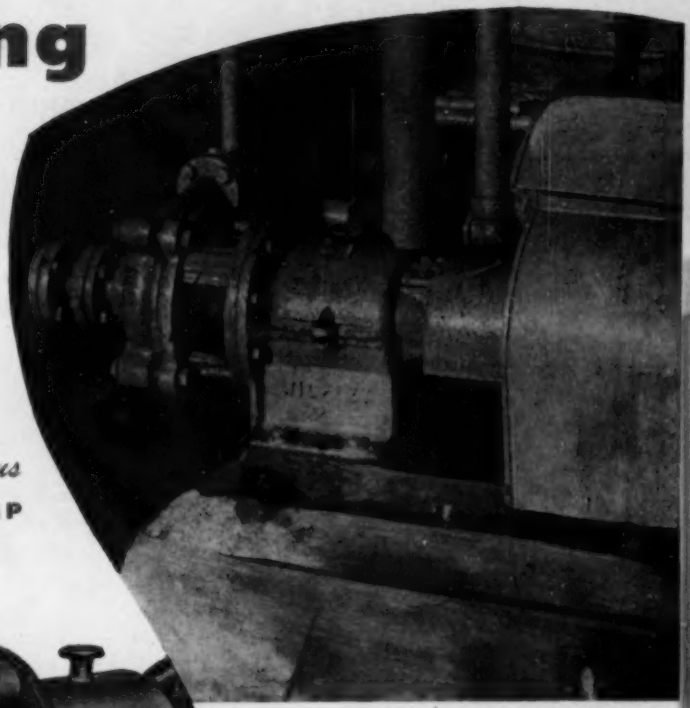
Infinite speeds — positive speed regulation — fingertip control — large indicator — positive pulleys — no springs — protected — balanced design — streamlined — Herringbone Rotor — through ventilation — shielded ball bearings — versatile mounting — NEMA dimensions — shock absorbing — quiet operation — rugged — compact — dependable — long life.

STERLING ELECTRIC MOTORS

Plants: New York 51, N. Y.; Los Angeles 22, California; Hamilton, Canada; Santiago, Chile.

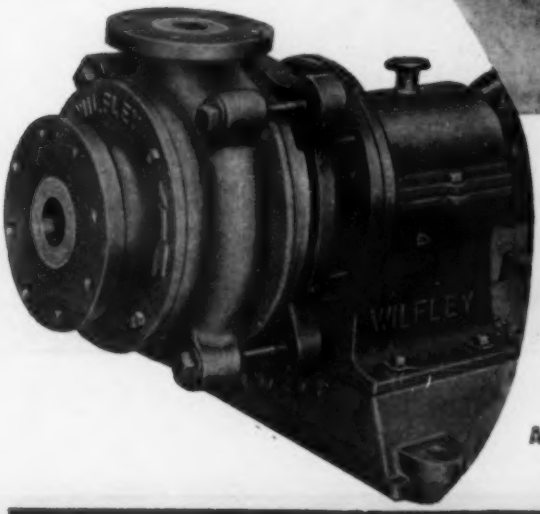
Offices and distributors in all principal cities.

Intermittent pumping



The WILFLEY Acid Pump at right, one of several in an Eastern acid plant, is intermittently pumping chlorine-saturated sulphuric acid, 90-93% concentration, at atmosphere temperature. WILFLEY'S exclusive design and construction make this pump a real cost-saver on this type of application.

Companion to the famous
WILFLEY SAND PUMP



Absolute dependability **under the pressure of 24-hour-a-day service has established WILFLEY Acid Pump as the leader in its field. This pump definitely increases production and saves costs in handling corrosives, hot liquids, mild abrasives and other solutions. 10- to 2,000-G.P.M. capacities; 15- to 150-ft. heads and higher. Wetted parts of practically all machinable alloys. Plastic lined models available. Individual engineering on every application. Write or wire for complete details.**

A. R. WILFLEY & SONS, INC., DENVER, COLO., U.S.A.
New York Office: 1775 Broadway, New York City

WILFLEY *Acid* PUMPS

CHECK ALL PUMP CONNECTIONS . . . .

Adopt this new habit

OF VALVE REPLACEMENTS ON ALL PUMP CONNECTIONS

Valve failure on pump lines is a hazard, especially in closed areas and where every precaution must be taken to avoid disaster. Some operators follow an old and dangerous habit of merely replacing a troublesome valve with a like valve, assuming that the new "old" valve will be a remedy. But if the old valve were right in the beginning it probably wouldn't need replacing.

Get the new, improved habit—replace with Nordstroms. Recheck each valve on your pump connections. Requisition Nordstroms. Make this standard practice—and eventually you'll have a really up-to-date set of valves that will end your valve problems permanently.

Nordstroms save space in restricted pump locations. They give positive shut-off because a quarter turn of the plug is an absolutely sure operation as contrasted with a valve dependent upon an exposed disc and seat that must be jammed together.

Ideal for chemical services—the lubricated valve seat is never exposed to the line

Nordstrom Valves

NOW AUTOMATICALLY LUBRICATED WITH Hypermatic™

TRADE MARK

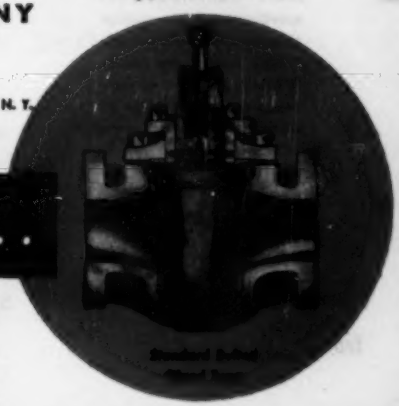
PATENTS APPLIED FOR

ROCKWELL MANUFACTURING COMPANY

400 North Lexington Avenue, Pittsburgh 8, Pennsylvania

Atlanta, Boston, Chicago, Columbus, Houston, Kansas City, Los Angeles, New York, Pittsburgh, San Francisco, Seattle, Tulsa ... and leading Supply Houses.

Export: International Division, Rockwell Manufacturing Company, 7701 Empire State Bldg., New York 1, N. Y.



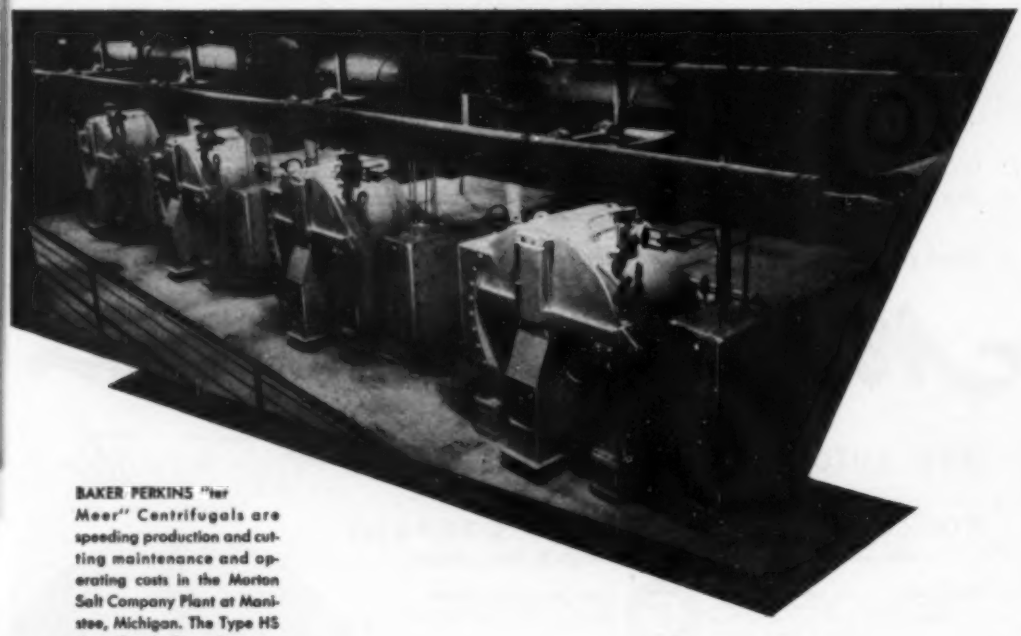
. . . FOR REPLACEMENTS AND . . .

to avoid hazards of leakage

INSTALL NORDSTROMS

CENTRIFUGATION

at a consistently high rate of production
and a high degree of efficiency
with four BAKER PERKINS HS-36
centrifugals at MORTON SALT CO.

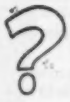


BAKER PERKINS "Ter Meer" Centrifugals are speeding production and cutting maintenance and operating costs in the Morton Salt Company Plant at Manistee, Michigan. The Type HS Centrifugals shown here are fully automatic but can be provided with manual controls if necessary. BAKER PERKINS makes a complete line of "Ter Meer" Centrifugals for the chemical processing industry. Write today for complete information.

BAKER PERKINS INC.
CHEMICAL MACHINERY DIVISION
saginaw, michigan

Carbon, Alloy and Stainless steel tubes are defined under CMP regulations as "controlled materials". As such, they are critical materials. Not being a mind reader, "Mr. Tubes"—your B&W Tube Company representative—needs a *close* look at the following facts in order to supply the available tubing most economically suited to your requirements.

1 All related CMP authorizations and government contract numbers.



2 Any acceptable alternates in type, finish, composition, and size.

3 A brief, informative description of your intended fabricating methods.

4 A description of the end-use, exact as to product and its service.

THE BABCOCK & WILCOX TUBE COMPANY

Executive Offices: Beaver Falls, Pa.

General Offices and Plants

Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
Alliance, Ohio—Welded Carbon Steel Tubing

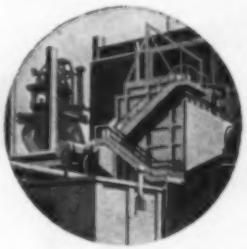
Sales Offices: Beaver Falls, Pa. • Boston 16, Mass. • Chicago 3, Ill.
Cleveland 14, Ohio • Denver 1, Colo. • Detroit 26, Mich.
Houston 2, Texas • Los Angeles 15, Calif. • New York 16, N. Y.
Philadelphia 2, Pa. • St. Louis 1, Mo. • San Francisco 3, Calif.
Syracuse 2, N. Y. • Toronto, Ontario • Tulsa 3, Okla.

B&W SEAMLESS and WELDED TUBES

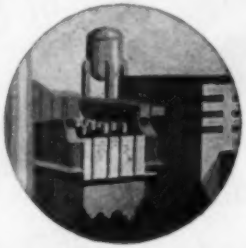
TA-1640-G

War on waste!

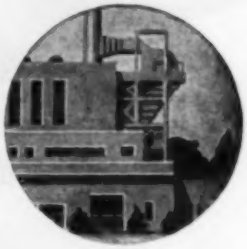
American industry is continually searching for new ways to stop waste and increase production and efficiency. A good example of this is the Koppers-Elex electrostatic precipitator. Shown below are a few typical ways industry uses them to combat waste . . .



BLAST FURNACE GAS must be cleaned before it can be used as a fuel. Koppers-Elex electrostatic precipitators clean this gas to residuals as low as .002 grain per cubic foot.



FLUE GASES from recovery boilers in pulp mills contain valuable materials. Koppers-Elex electrostatic precipitators recover several hundred thousand dollars worth of these materials yearly.



FLY ASH from power plants and factories may drop a blanket of dust extending three to five miles. Koppers-Elex electrostatic precipitators stop this nuisance and preserve public good will.

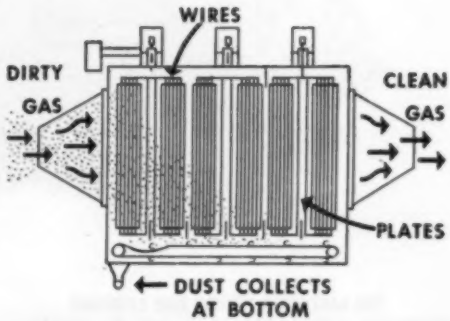
Guaranteed: All Koppers-Elex electrostatic precipitators are guaranteed to equal or better (under tests made by your own personnel) any efficiency or residual content you specify.

ENGINEERS! You should know about these six design features of Koppers-Elex electrostatic precipitators!

KOPPERS has made sweeping improvements in electrostatic precipitator design! For example, double chambers eliminate expensive by-pass systems and the resultant loss of materials during inspection or maintenance. And re-entrainment is sharply reduced because rapping is sectionalized.

Successive collection zones are separately energized to provide maximum voltage for highest collection. And because each field is, in effect, a separate precipitator, the outage of one field *does not stop* gas-cleaning action. In addition, completely enclosed and compact "package" mechanical or vacuum tube power packs simplify installation and operation.

Another exclusive Koppers feature is the drag scraper which provides continuous dust removal, eliminates plugged hoppers and prevents bothersome dust build-up. For detailed information on recovery, gas-cleaning or nuisance abatement results write today to: Koppers Company, Inc., Precipitator Dept., 310 Scott Street, Baltimore 3, Md.



If you have a gas-cleaning problem, write today to: Koppers Company, Inc., Precipitator Dept., 310 Scott St., Baltimore 3, Md.

KOPPERS

Koppers-Elex ELECTROSTATIC PRECIPITATORS

DOWELL USES *Tri-Sure* CLOSURES

Reconditioning a well with Dowell Plastics. Dowell always ships its plastics, plastic catalysts and oil thickening agents in drums equipped with Tri-Sure Closures.

DOWELL plastics are used for reconditioning oil wells—for example, in controlling water and gas, consolidating sand, setting liners and casing, and correcting faulty cement jobs.

To perform these important functions, the plastics must reach the field in perfect condition—free from contamination of any kind. So Dowell Incorporated always ships its plastics in drums equipped with Tri-Sure Closures.*

Where protection in transit is a *must*, you will find Tri-Sure Closures an essential part of marketing. Give *your* product and *your* prestige the security of Tri-Sure's *leak-proof and tamper-proof flange, plug and seal*. On your next drum order specify "Tri-Sure Closures".

The "Tri-Sure" Trademark is a mark of reliability backed by 29 years serving industry. It tells your customers that genuine Tri-Sure Flanges (inserted with genuine Tri-Sure dies), Plugs and Seals have been used.

Tri-Sure
Reg. U. S. Pat. Off.
CLOSURES

AMERICAN FLANGE & MANUFACTURING CO. INC., 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.
TRI-SURE PRODUCTS LIMITED, ST. CATHARINES, ONTARIO, CANADA

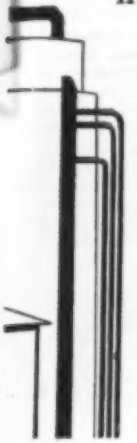
outstanding

for dependable quality and uniformity

PICCO

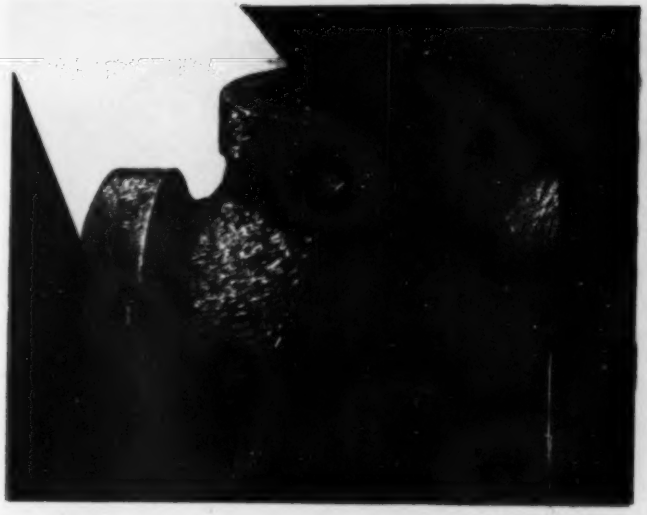
SOLVENTS AND SOLVENT OILS

Hi-Solv Aromatic Petroleum Naphthas
PICCO Coal Tar Naphthas
Hi-Solv Heavy Naphthas
PICCO Coal Tar Heavy Naphthas
Hi-Solv Solvent Oils · PICCO Heavy Oils



Write for factual bulletin describing Picco Solvents and Solvent Oils. We will gladly send samples. Specify application, so we can furnish suitable grade.

PENNSYLVANIA INDUSTRIAL CHEMICAL CORP.
Clairton, Pennsylvania
Plants at CLAIRTON, PA.; WEST ELIZABETH, PA.; and CHESTER, PA.
Representatives in Principal Cities



what's this... a subversive casting?

Castings, like people, can prove to be unsound . . . dangerous. And the concealed faults in either are difficult to detect until the damage is done.

Manufacturers who insist upon sound steel castings know from long experience that they can depend on Sivyer. The most rigid metallurgical control . . . every known scientific test . . . combine to assure the internal integrity of Sivyer Castings. The result . . . longer service life, extra dependability, under the toughest conditions.

You don't need a congressional investigation to get rid of subversive castings in your operation. Look for the famous Sivyer Ⓢ which guarantees a 100% dependable steel casting.

SIVYER

SPECIALISTS IN HIGH ALLOY AND SPECIFICATION STEEL CASTINGS

SIVYER STEEL CASTING COMPANY • MILWAUKEE Ⓢ CHICAGO Ⓢ

Taylor Sillimanite-Fortified (Tasil-F) refractories*—widely used in the glass and metallurgical industries for those critical furnace areas subjected to batch carry over or fluxes at high temperatures—are fortified with ALCOA Alumina.

This photo shows the excellent condition of Taylor Sillimanite-Fortified (with ALCOA Alumina) brick and burner block in the back port of a cross-fired continuous glass container tank. After 276 operating days, the Tasil-Fortified (Tasil-F) brick extended 2½" to 3" beyond the adjacent super-duty fire clay brick. Note also that the burner opening or throat changed very little in either shape or dimension. This tank melted alternately flint and opal glasses at approximately 2700°-2750°F. for a total of 78 days on flint, 198 on opal. Total combined production was 11,131 tons consisting of 8,251 tons opal and 2,880 tons flint.

Bricks and shapes fortified with ALCOA Alumina are outstanding for high hot load strength and volume stability at temperatures above 2900°F. Their higher operating efficiency for the entire life of the refractory actually makes them the most economical to buy.

We do not make refractories, but we will gladly refer you to reliable sources. Write to: ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 602K Gulf Building, Pittsburgh 19, Pennsylvania.

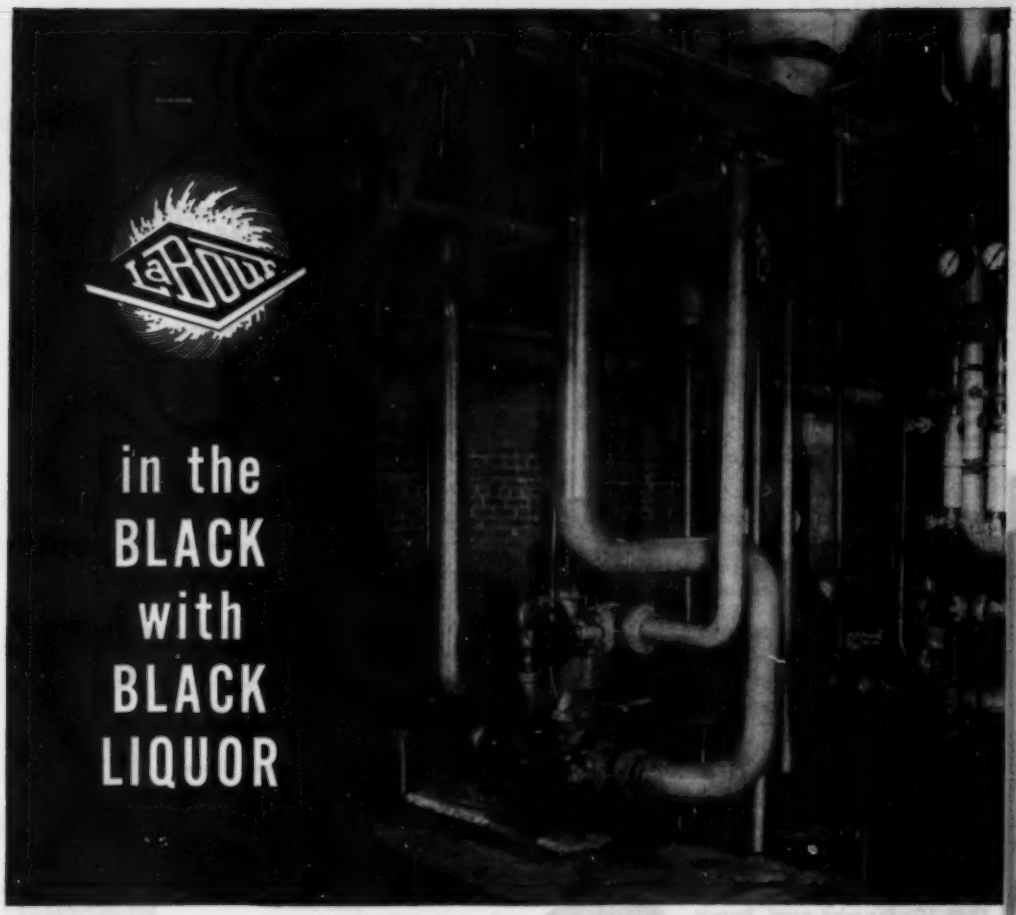
**Manufactured by The Chas. Taylor's Sons Co., Cincinnati, Ohio, "Refractories to industry since 1864."*

Alcoa Chemicals

ALCOA

ALUMINAS and FLUORIDES

ACTIVATED ALUMINAS • CALCINED ALUMINAS • HYDRATED ALUMINAS • TABULAR ALUMINAS • LOW SODA ALUMINAS
ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOBORIC ACID • CRYOLITE • GALLIUM



It isn't hard to figure what a pump failure would do to operating costs on the five-body, quadruple effect black liquor evaporator served by these pumps. That's why they're LaBours, and *that's* why there's no red ink in the accounting.

This Kraft mill job was built by Swenson Evaporator Company, who specified the LaBour pumps because they've had a lot of experience with them over the years. There isn't any substitute for dependable service, and LaBour's have proved their dependability beyond question.

We'll be glad to show you how LaBour simplicity reduces pump failures and assures uninterrupted service. Just ask us.

ORIGINAL MANUFACTURERS OF THE SELF-PRIMING CENTRIFUGAL PUMP

LABOUR

THE LABOUR COMPANY, INC. ★ Elkhart, Indiana, U.S.A.

Century 1 TO 400 H.P. MOTORS

Choose From These Many Types To Fit Your Job

DEPENDABLE CONSTRUCTION . . . Plus

PROPER SELECTION MINIMIZE SHUTDOWNS

Century Electric Company is celebrating its 50th year in the electrical industry.

It's easy to select the proper electric motor for your job from Century's complete line — from 1/6 to 400 horsepower. A wide range of types and kinds are available to satisfy all popular requirements. They are carefully designed, built and tested to assure maximum performance throughout their long life.

Here are examples of Century's line of INTEGRAL HORSEPOWER motors.

Polyphase

TYPE SC—Open Drip proof General Purpose Motor. Meets the needs of most installations where operating conditions are relatively clean and dry.

TYPE SC—Splash proof. Supplies protection where plants must be washed down. Keeps out all falling or splashing liquids—rain, snow, sleet, etc.

TYPE SC—Totally Enclosed Fan Cooled. Protects against dusts, mist, oil, fog. Inner frame protects vital parts of the motor, seals out harmful matter.

TYPE SC—Explosion proof. Protects life and property in atmospheres charged with explosive dusts or gases.

TYPE SR—Wound Rotor. Open Construction. Ideal for applications requiring low starting current with high starting torque, reversing or adjustable speed.

TYPE SR—Wound Rotor Splash proof. Same electrical characteristics as motor shown above. In addition, gives adequate protection against falling and splashing liquids.

Single Phase

TYPE RS—Repulsion Start Induction, Open Construction, Single Phase Brush Lifting Motor. Combines high starting torque with low starting current.

683

TYPE RS—Splash proof. Same advantages as open construction, plus protection against splashing and falling liquids.

TYPE CSH—Capacitor Start Induction, Single Phase Motor. Suitable when high starting torque with normal starting current is satisfactory.

TYPE CSH—Splash proof. Same advantages as motor shown above, plus protection against falling and splashing liquids.

Direct Current

TYPE DN—Direct Current Motors. Suitable for use where direct current is available, or its use desirable.

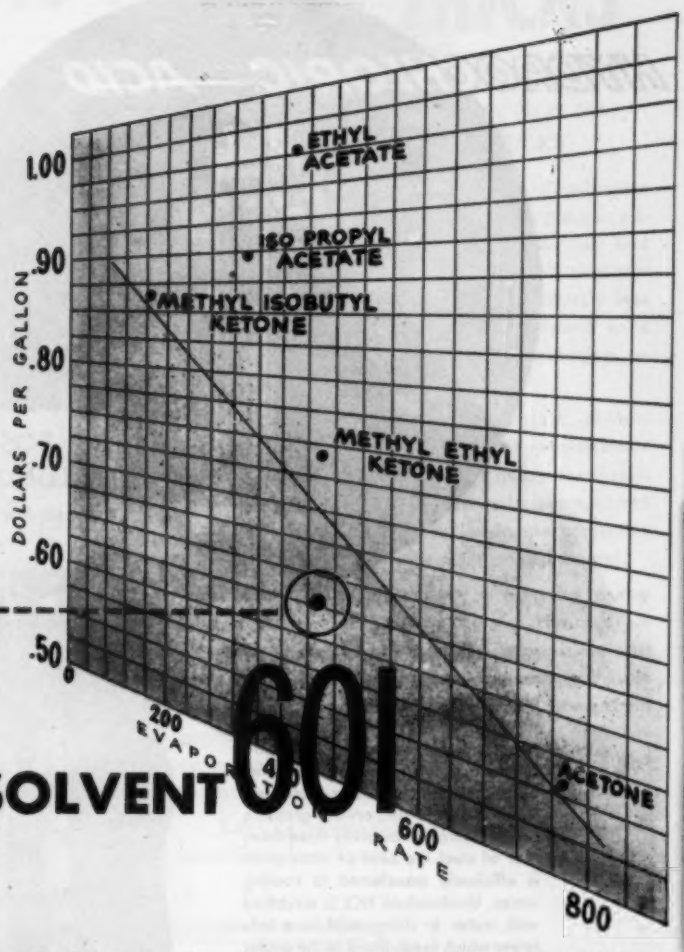
TYPE DN—Direct Current, Splash proof.

TYPE SY—Synchronous. Suitable for continuous operation at a uniform load for power factor correction.

In addition to a complete line of integral horsepower motors, Century offers fractional horsepower motors, gear motors, generators, AC and DC motor generator sets.

For a long life of satisfactory performance, specify Century motors for all your electric power requirements.

CENTURY ELECTRIC COMPANY, 1806 Pine Street, St. Louis 3, Missouri • Offices and Stock Points in Principal Cities



Buy in the area of economy

CELANESE* SOLVENT 601

Excellent performance and real production economy have established Celanese Solvent 601 as the most economical active solvent.

Compare Solvent 601 with the five solvents commonly used in the production of varnishes, lacquers, adhesives, and other nitrocellulose formulations. Solvent 601 supplies the rate of evaporation you require, yet it stays within the "area of economy."

More and more manufacturers are taking advantage of the solvent balance offered by the combination of methyl ethyl ketone and cyclic oxides found in Solvent 601.

Investigate the usefulness of Celanese Solvent 601 in your operations. For samples, prices and additional data, write: Celanese Corporation of America, Chemical Division, Dept. 503-J, 180 Madison Avenue, New York 16, N. Y.

Celanese*

*Reg. U. S. Pat. Off.

CHEMICALS

ACETIC ACID • ACETALDEHYDE • FORMALDEHYDE • PARAFORMALDEHYDE • ACETONE • BUTYL ALCOHOLS • METHANOL
NORMAL PROPANOL • BUTYLENE GLYCOLS • DIPROPYLENE GLYCOL • PROPYLENE GLYCOL • PROPYLENE OXIDE • TRICRESYL PHOSPHATE

HYDROCHLORIC ACID

FOSTER WHEELER FALLING FILM ABSORBER
at the Baton Rouge plant of the Ethyl Corporation

Foster Wheeler Falling Film Absorbers are proving particularly efficient for absorption of Hydrogen Chloride in weak Hydrochloric Acid.

Absorption takes place on the inside surfaces of corrosion resistant "Karbate" tubes in a cooler absorber. Since "Karbate" impervious graphite has a thermal conductivity three times that of steel the heat of absorption is efficiently transferred to cooling water. Unabsorbed HCL is scrubbed with water or dilute acid in a tails tower which feeds liquid to the cooler absorber.

For some time, four 60-tube units have been in service at the Ethyl Corporation at Baton Rouge, Louisiana. These absorbers boost 21% acid to 33% concentration for the manufacture of anhydrous HCL required in production of Tetra Ethyl Lead.

For further information, write to:
FOSTER WHEELER CORPORATION
165 BROADWAY NEW YORK 6, N. Y.

FOSTER WHEELER

Leading engineers and builders of industrial processing equipment, chemical plants, heat exchangers, steam generators, and oil refineries.

"TEACH YOUR OLD CAT NEW TRICKS"

Is coke burning capacity limiting your high octane gasoline yield?

Are you cycling refractory gas oils which can only be cracked to a low gasoline yield at excessive coke make?

Or are you chewing up cat cycle stock in thermal units which could much more profitably be put to other uses such as running additional crude?

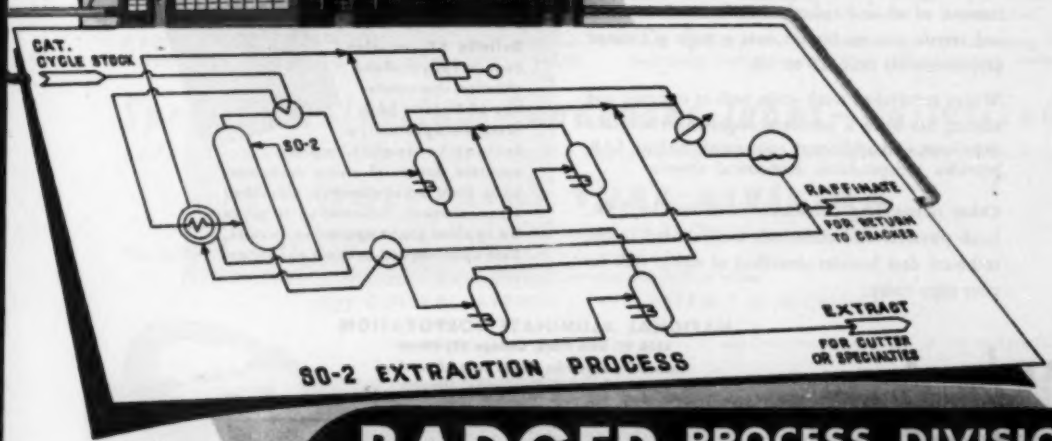
INVESTIGATE SO_2 EXTRACTION OF CATALYTIC CYCLE STOCKS

This process will give high yields of raffinates which crack as well or better than virgin gas oil. The extraction operation removes sulfur and heavy aromatics, and the resulting raffinate will give a high gasoline yield, with frequently less coke than your fresh feed. This reduced coke make may permit recycling to extinction in your existing catalytic unit.

The extracts are highly aromatic, of low viscosity, and can be worked up into specialties or used for the viscosity cutting of heavy residuals. Depending upon your local utility balance, direct operating costs . . . utilities, labor, maintenance and solvent . . . may be less than 5c a barrel.

SO_2 extraction has been proved by many years of dependable operating experience. The solvent is cheap, universally available, and because of its low boiling point, product contamination and solvent recovery present no problems. Furthermore, an SO_2 plant is adaptable to running all types of stocks from light naphthas to heavy gas oils.

Let us give you more information about this versatile refinery tool.



SO-2 EXTRACTION PROCESS

BADGER PROCESS DIVISION
OF STONE & WEBSTER ENGINEERING CORPORATION

BOSTON NEW YORK
LONDON E. B. Badger & Sons (Great Britian) Ltd.

Process Engineers and Constructors for the Petroleum, Chemical and Petro-Chemical Industries

Microphoto of Nalcite SAR spheres, designed for uniform liquid distribution, minimum channeling and bed packing.

a new,

STRONGLY BASIC ANION EXCHANGE RESIN

USE of Nalcite SAR, strongly basic anion exchange resin, assures substantially complete removal of all acid-radical constituents from water and certain process liquids over a wide pH range (approximately from 2.0 to 10).

Where removal of weak acids, such as carbonic and silicic, has been a problem requiring elaborate techniques and additional equipment, Nalcite SAR provides a dependable, economical answer.

Other outstanding characteristics of Nalcite SAR, both physical and chemical, are detailed in the technical data booklet described at right. Ask for your copy today.

Technical Data on NALCITE SAR

Bulletin 37 contains complete physical and chemical characteristics of Nalcite SAR, with sample calculations to enable rapid, accurate design of anion exchanger units. Data is correlated for simplified cross-reference. Information is given on typical plant operating results. Sent upon request, without obligation.

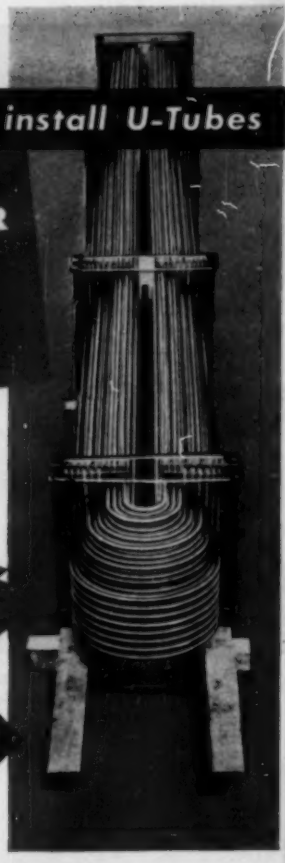
NATIONAL ALUMINATE CORPORATION
6216 W. 66th Place, Chicago 38, Illinois
Canadian inquiries should be addressed to Alchem Limited, Burlington, Ontario

THE *Nalco* SYSTEM . . . Serving Industry through Practical Applied Science

Now

A faster and more economical way to install U-Tubes

Here's how the finished package comes to you. Simply remove the protective covering and the tubes are ready for installation. Either Wolverine Trufin or plain tubes can be shipped to you on this kind of pallet.*



At the right is shown one of the shipping pallets fully loaded. It shows the tubes bent to the correct radii, packed for immediate pallet-to-condenser installation.

Look at all these Advantages:

1 Tubes are fed directly, from shipping pallet into heat exchanger or condenser as they are needed! They are all bent to the correct radii and packed in the right sequence—in line or staggered—according to your prints. Removal can be made from the end or top of pallet.

2 All tubes for one condenser are shipped on one pallet.

3 Instant inspection—eliminates sorting, counting, and handling.

4 Pallet can be handled with existing equipment. Present handling equipment is needed only once to bring pallet to the job.

5 Hairpin-bend tubes eliminate one tube sheet or header.

6 Pallet saves time, crane movements, storage and working space.

7 Pallet is easily knocked down and returned. Supporting straps are cushioned with rubbery compound to protect tubes.

8 Pallet eliminates the time and expense of removing and destroying crating resulting from antique packing methods.

Specify Wolverine Condenser Tubes—Palletized!

WOLVERINE TRUFIN AND THE WOLVERINE SPUN END PROCESS AVAILABLE IN CANADA THROUGH THE UNIFIN CO., LONDON, ONT.

WOLVERINE TUBE DIVISION

Calumet & Hecla Consolidated Copper Company

INCORPORATED

Manufacturers of seamless, non-ferrous tubing

1427 CENTRAL AVENUE • DETROIT 9, MICHIGAN

Wolverine Condenser Tubes stocked by Butler Industries, Inc., 333 South Fourth Street, Beaumont, Texas • Tel.: Beaumont 3-2351

*Reg. U.S. Pat. Off.

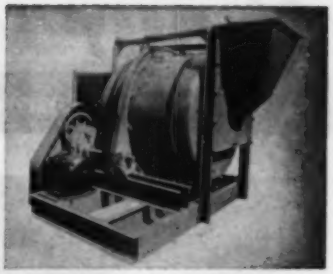
PLANTS IN DETROIT, MICHIGAN AND DECATUR, ALABAMA

Sales Offices in Principal Cities

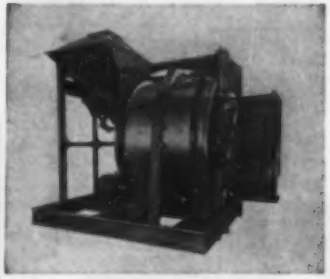
Export Department, 13 E. 40th St., New York 16, N. Y.

CHEMICALS—Equipped with liquid measuring tank for use in various chemical applications.

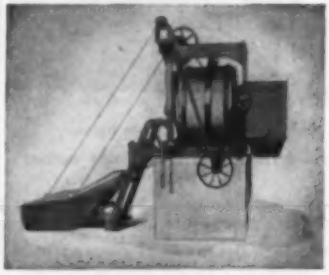
CHEMICALS • DRUGS • PLASTICS METALS • FOOD • CANDY—Pan is tilted and rotated by motors. Capacities up to 3090 lb.



COMPOSITION MATERIALS • INSULATING AND REFRACTORY CHEMICALS • CLAY • GLASS BATCHES • FOUNDRY CORE SAND—13 cu ft dry mixer on skids.



ENAMEL FRITS • GLASS—50 cu ft dustproof mixer. Fully-automatic, electrically controlled charging and discharging.



FURNACE CHARGES • GLASS BATCHES—28 cu ft mixer with elevating power loader.

How To Straighten Out Your Mixer Problems

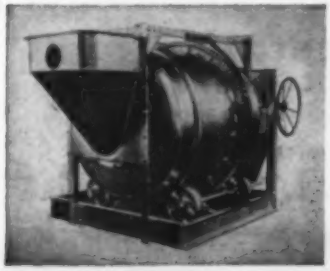
What do you mix? Here's a partial line-up of industrial mixers bearing the famous Worthington-Ransome trademark—which means the right design for every type of mix.

And you'll find in every mixer the following Worthington-Ransome features: *thorough* mixing (or blending) of even the finest dry materials or colors in any proportion . . . *clean* discharge . . . *dustproof* design (where required) . . . *heavy-duty* construction.

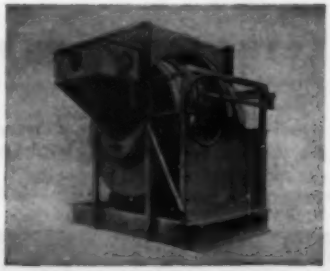
For solution of your particular mixing problem or for free bulletins, write: Worthington Pump and Machinery Corporation, Ransome Industrial Mixer Division, Dunellen, New Jersey.

WORTHINGTON

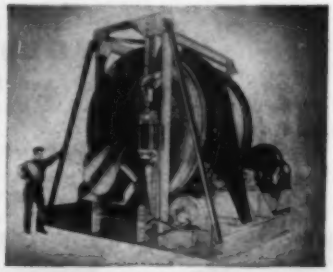
YR.1.1



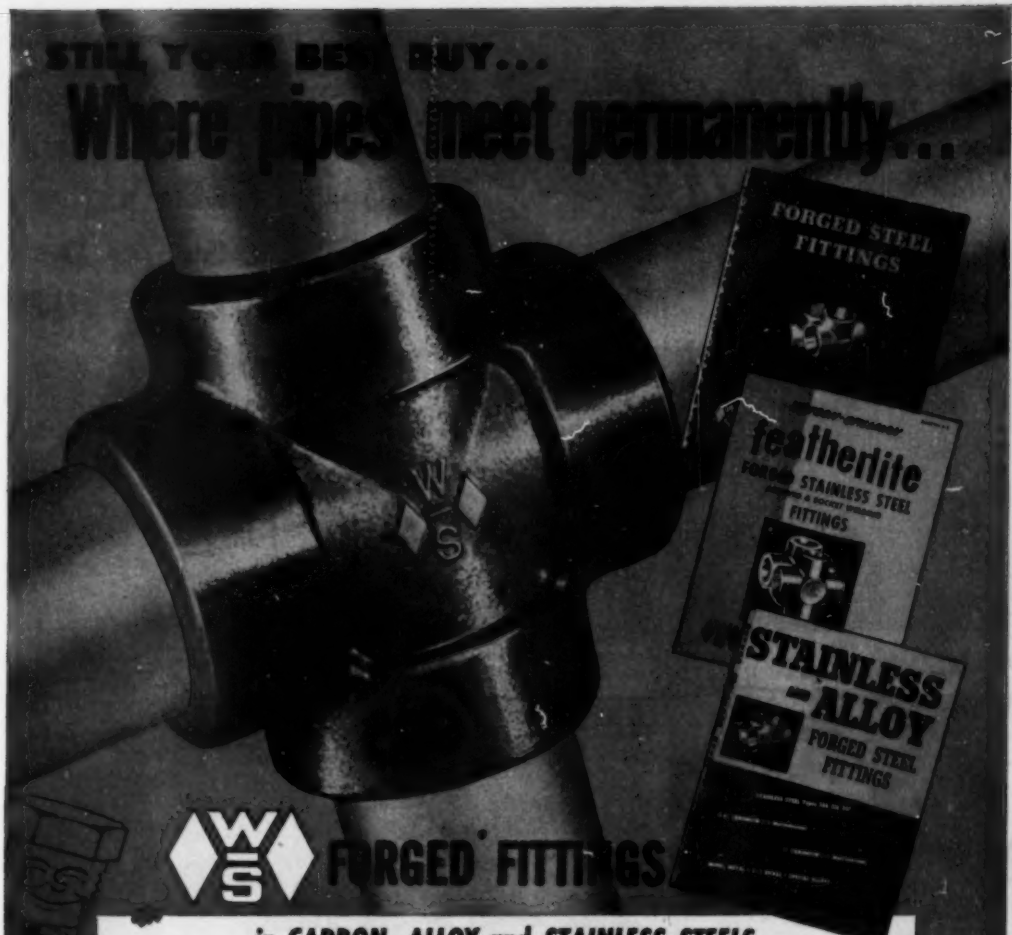
SOAP POWDER • PIPE TOBACCO • SNUFF—Dustproof mixer for blending and mixing.



FERTILIZER—Standard sizes, ½, 1, 2-ton capacity. Also used for asbestos products, etc.



FURNACE CHARGES—One of the largest industrial mixers—batch capacity of 260 cu ft.



STILL YOUR BEST BUY...

Where pipes meet permanently...

W-S FORGED FITTINGS

in CARBON, ALLOY and STAINLESS STEELS

. . . Still your best buy, because W-S longer service life and increased dependability give that permanency which will lower maintenance costs . . . They are drop forged.

Basic materials are selected from a wide choice of carbon, stainless and alloy steels and then subjected to the most exacting metallurgical controls from melt to bar. Through these precautions and subsequent precision machining operations, W-S assures the utmost in accuracy of finish, perfection of threads, sockets, angles and concentricity. All W-S Fittings, — Screwed and Socket Welding Types, — are finally instrument inspected.

W-S Bulletin A3-50 details the Carbon Steel Line. Bulletin S-1 is devoted to Stainless and the Alloys. W-S will gladly furnish information on the new FEATHERLITE Fittings — a recent big step in a wide range of services. Write today for the specific bulletin you desire.

Sold Through Leading Distributors

9-L-2

DISTRIBUTOR PRODUCTS DIVISION

WATSON-STILLMAN

Established 1848

ROSELLE, NEW JERSEY

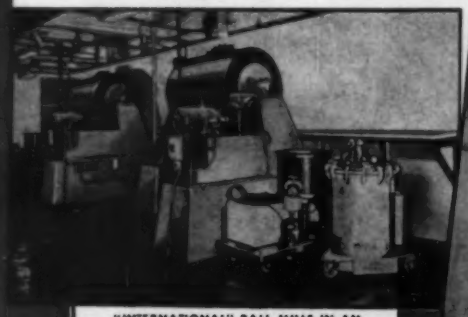
Designers and Manufacturers of Forged Steel Fittings, Valves, Wire Rope, Slings, Steel Hooks, Rings, Reactors and Hydraulic Equipment

put "International"

TO WORK IN YOUR PLANT

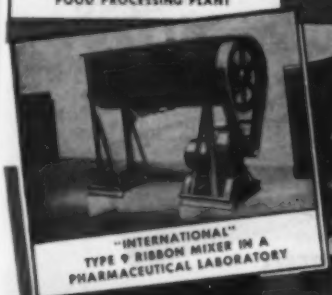
TO CUT COST AND IMPROVE PRODUCTION

"INTERNATIONAL" TYPE 6E DRY BLENDER IN A FOOD PROCESSING PLANT



"INTERNATIONAL" BALL MILLS IN AN ENAMELING PLANT (No. 5 DRIVE ARRANGEMENT)

"INTERNATIONAL" AGITATOR INSTALLED IN FISH CANNERY COOKER



"INTERNATIONAL" TYPE 9 RIBBON MIXER IN A PHARMACEUTICAL LABORATORY

"INTERNATIONAL" RIBBON MIXER IN A PLANT MAKING AUTOMOTIVE RADIATOR SOLVENTS AND CLEANING COMPOUNDS

"INTERNATIONAL" SIDE ENTRANCE MIXERS HOPPER CAR INSTALLATION

"INTERNATIONAL" PORTABLE MIXERS IN A GELATIN PRODUCTS PLANT

INTERNATIONAL PROCESSING EQUIPMENT is the logical answer to problems of Blending, Treating, Mixing and Grinding of Chemical components in any desired size, capacity or requirement

Remember—"INTERNATIONAL" Builds and Guarantees the equipment you need to get more production at lowest operating cost. Ask for Special Catalog and complete information on any equipment, today No obligation, of course.

TYPE "SGR" Top Entering AGITATOR

INTERNATIONAL ENGINEERING, INC.

DAYTON 1, OHIO

NEW YORK—15 Park Row
CHICAGO—407 S. Dearborn St.

DISTRICT REPRESENTATIVES IN PRINCIPAL CITIES

Memo from the Editor John R. Callaham

Several weeks ago I asked Elliot Schrier, now our West Coast editor for close to four months, how he was making out. Here's what he has to say about the behind-the-scenes life of a new CE field editor.—*JRC*

YOU ASK me how I'm making out! You should know better, John.

What I've gone through in the past three months has certainly been an experience for me. As a graduate student I had some responsibilities as laboratory instructor in physical chemistry at Stanford University. I had more as a training officer at summer camp. But neither came anywhere close to the responsibilities thrust upon me as CE's West Coast editor.

Since July I've interviewed over 145 people in going after (but not always getting) stories on processes that in some cases I never heard of before. And don't forget it's part of my job to guide the CE work of our 15 western correspondents from Albuquerque to Honolulu and from San Diego to Vancouver.

Remember that development in the beet sugar industry you tipped me off to? When you gave it to me, all I knew about beet sugar was that my wife bought cane sugar. So I spent the better part of the next few nights studying up on how beet sugar is refined. By the time I went after the story I understood the peculiar problems in the field.

Well, I'm getting the story—and it's on a real development, too. But the point I want to make is this: practically every assignment is turning out to be a basic education in some segment of the chemical process industries.

It was the second day I was on the job, I believe, that George Stern, Pacific Coast manager for Heyden, asked me out to lunch. He spent three hours briefing me on such items as committees I might wish to join, meetings I might wish to attend and people I should meet. George was the first of the many people in industry who've gone far out of their way to welcome me. This willingness to help is a characteristic of the industry out here.

CE's reputation in both large and small chemical companies also helped me get established. Before I had been on the job long, I found that the reputation of CE rubbed off on me. People accepted me as an editor of CE long before they accepted me as Elliot Schrier.

A successful engineering editor, I've found, must also be part salesman, part reporter and writer, and part psychologist (not to mention such functions as employment counselor and bureau of information manager).

I'm surprised at times by the vast fund of knowledge I'm supposed to have at my finger tips. In one typical day recently a member of the OPS wanted to know about the West Coast supply of chlorine and sulphuric acid; a technical director preparing a talk called for statistics on the growth of the West Coast chemical industry during the past decade (including capitalization, capacity and employment); an independent inventor wanted the latest information on continuous production of steel. I don't pretend to know all the answers; but I do realize I have to know where to look for them.

An important part of my duties comes after hours. What the golf course is to the advertising department, after-hour society and committee meetings are to the editorial staff. My wife tells me that she is happy the baby we're expecting will arrive in time to keep her company when meetings increase in frequency. Already I spend an average of two evenings a week away from home at meetings. This is not to be considered work. . . .

When I develop a story out here I'm never quite sure it will reach print in New York. So, you see, I have a double selling job—selling CE to the profession and selling you New York editors. Sometimes we have disagreements over what is and what is not suitable for CE—and how much space suitable material should get.

This honest difference of opinion, I know, goes far toward keeping CE on its toes. That is how it should be, for with correspondents sending in material from all over the world, and with regional editors covering the United States, it's up to somebody in New York to keep tabs on content and style.

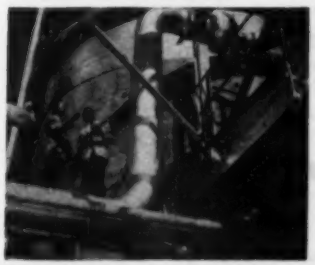
Jim Lee, down in Houston, thinks the Southwest is the industrial land of Canaan; I'm sure Frank Byrnes in Chicago thinks there is no place like the Midwest; I know darn well the Pacific Coast is far and away the up and coming industrial area of the U. S.

I'm glad I cover the Pacific process industries for CE!

ELLIOT SCHRIER

BY DAY . . .

WITH W. B. Van Arsdel of WRRL.

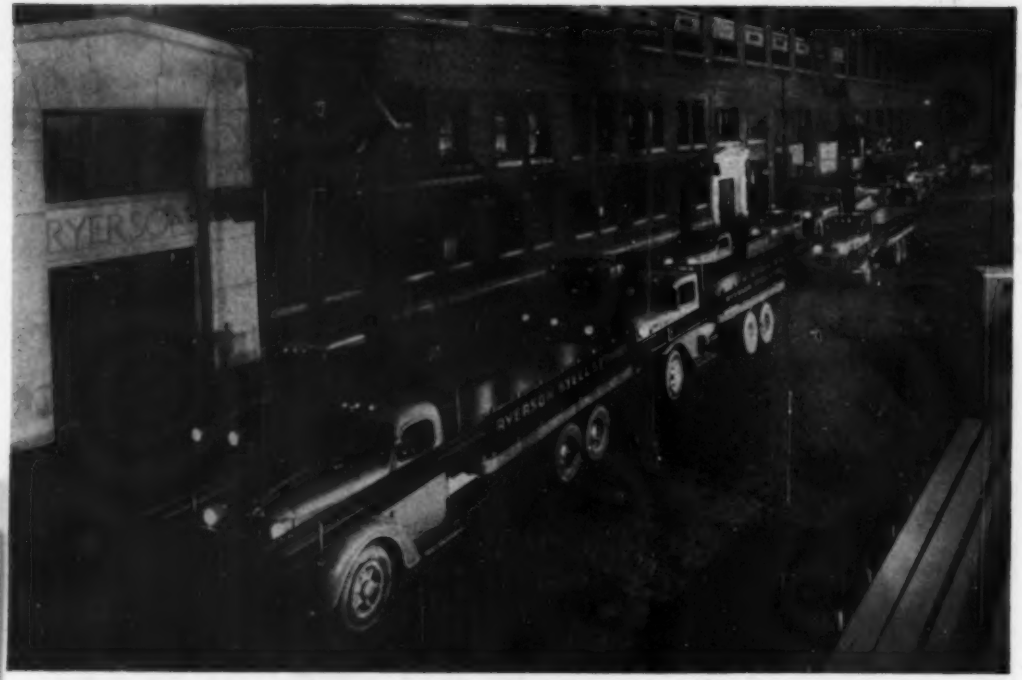


WITH Bill Allis of Standard of California.

BY NIGHT . . .

WITH George Stern of Heyden Chemical.

WITH slide rule and dictaphone.



Working Late... To Ship Steel Early

Here are Ryerson trucks all loaded by the night shift and ready to be on their way to our customers—early in the morning. This "after-hours" operation is typical of the way we work at Ryerson to speed up your steel deliveries.

Every kind of steel is on hand for quick shipment at your nearby Ryerson Plant. Though stocks are currently out of balance due to ever-increasing defense needs and unprecedented civilian demand, we are still able to serve you.

Your Ryerson representative has specific answers to your questions involving the purchase, application or fabrication of steel. He is fully posted, for instance, on the new alloys and on practical substitutes for hard-to-get steels. So, for any kind of steel—for complete steel service—call your nearest Ryerson Plant.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled and cold finished
STRUCTURALS—Channels, angles, beams, etc.
PLATES—Many types including Inland 4-Way Safety Plate
SHEETS—Hot and cold rolled, many types and coatings
TUBING—Seamless and welded, mechanical and boiler tubes
ALLOYS—Hot rolled, cold finished, heat treated. Also tool steel
STAINLESS—Stainless bars, plates, sheets, tubes, etc.
BABBITT—Five types, also Ryertex plastic bearings
MACHINERY & TOOLS—For metal fabrication

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND
DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

SIDNEY D. KIRKPATRICK, Editorial Director *JOHN R. CALLAHAM, Editor*

Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

OCTOBER 1951

Wanted: More Recruits for Professional Services

Why are some men willing and anxious to work for their fellow men? Why should an engineer, for example, give some of his "time and thought and energy to the profession of which he is a part"? What is the motivation for personal participation in the active work of our engineering and technical societies? Thoughtful answers to questions such as these will be found in Chairman Harry S. Rogers' annual report to the Engineers Council for Professional Development.

Convening currently in Boston for its 19th annual meeting, ECPD faces serious responsibilities and problems in its newer role as an inter-society, intra-professional organization. Its primary concern, now as always, is in the training, growth and development of the engineer as an individual—from the time he seeks to enter college until he has reached full recognition of his professional status. But under its newly revised charter, ECPD committees have embarked on several important programs that can mean a great deal to the future of our profession.

To aid young engineers in their first five years of professional development is a responsibility which industry must share with our colleges and engineering societies.

In-service training can often be supplemented by extension courses for continued college education. Introduction into industrial responsibilities parallels indoctrination into community and professional responsibilities. But to make really effective the broad gage program outlined by the ECPD Committee on Professional Training, calls for both men and money. A minimum of $20,000 a year is needed to employ a field director to organize the volunteer efforts now getting under way in several industrial communities. But so far only ASME, AIEE and the Engineering Foundation have pledged financial support. Industry, which benefits most, should underwrite a major share.

Looking to the future, Chairman Rogers is most concerned with the recruitment of more professional personnel into the work of the Council. Too often one finds only the same relatively small group of volunteers who are willing to man the committees and carry out the organized work of the profession. Too often the sponsoring societies, having first call on the services of their members, have not assigned properly qualified personnel to participate in the ECPD program.

Therefore it was most appropriate for Dr. Rogers to discuss the motivating forces that lead men to undertake these extra-curricular services to the engineering profession. There is, as he recognizes, a quid-pro-quo and a pride in membership in the various engineering societies—all of which commands allegiance, loyalty and devotion. The program of ECPD, on the other hand, brings only a very indirect return to society members. It is a service program to the juniors of the profession. Its motivation must be primarily a motivation of service.

To carry out the very worthwhile program of ECPD, Dr. Rogers concludes that "we must find more—and there must be many more—persons who have an earnest desire to help in a situation in which the returns may have no immediate professional significance to those who participate in it."

Here is a challenge that demands self sacrificing interest from mature chemical engineers—from men who have lived the problems of the young engineer and are willing to pass on their accumulated wisdom and experience. There are few ways in which any of us can contribute more to the long-range advancement of the engineering profession.

Sidney D. Kirkpatrick

METAL 1,000-lb. forging is end-cut. Midvale Co. will forge large rings for Westinghouse jet engines.

PLANTS First big plant is that of Titanium Metals at Henderson, Nev., already in production.

TITANIUM – 1951

Here is the titanium picture as of today–processes, plants, possibilities and production–brought sharply into focus for you by News Editor Joseph A. O'Connor.

Titanium developments are coming in as fast as F-86 Sabre jets over Mig Alley. Horizons Titanium Corp. is heading into the wild blue with a new process that may bring down the cost of producing titanium. The ceiling on output is lifting dramatically—up from pounds to tons and more tons. New companies are winging into action. Production techniques are getting better all the time. The first big plant for the production of titanium metal has just started operating. And negotiations are nearing completion for another.

NEW PLANTS

The $14 million plant of Titanium Metals Corp. of America at Henderson, Nev., is already turning out titanium metal for shipment. Titanium Metals, jointly owned by National Lead Co. and Allegheny Ludlum Steel Corp., has leased from the Colorado River Commission major components of the wartime plant of Basic Magnesium, Inc., at Henderson, built by the government at a cost of $150 million. They are being revamped to turn out titanium. Contracts have also been signed with the commission for 151 million kilowatt-hours per year from Hoover and Davis Dams. By late 1952 the new plant will be turning out titanium at a minimum clip of 3,600 tons a year.

Meantime, the government has just about reached agreement with E. I. du Pont de Nemours & Co., Inc., for Du Pont to build a large titanium plant. Most probable location: Edge Moor, Del., near Wilmington. Its 10-ton-a-day output would make it about as big as the Henderson plant.

NEW PROCESS

The new process of Horizons Titanium Corp. is expected to cut the cost of producing titanium metal from the present $5 per lb. for sponge to $1 or less, according to the Navy. It's supposed to be an electrolytic process and was developed by Eugene Wainer in the Cleveland, Ohio, laboratory of Horizons, Inc. Horizons Titanium will build a pilot plant in Cleveland to produce titanium by the new process.

TONNAGE TITANIUM

Present output of titanium is probably between 500 and 1,000 tons per year. But by the end of 1952 or shortly thereafter production of the metal is expected to reach 5,000 tons a year or better. And one government authority soberly estimates there's a 50,000-ton-a-year market waiting for the wonder metal right now if a cheap process can be found producing it.

NEWCOMERS

More companies are getting into titanium all the time. Horizons Titanium Corp., for example, is a joint venture of Horizons, Inc., and Ferro Corp. Monsanto Chemical Co. and National Research Corp. have teamed up to push research at Monsanto's Dayton, Ohio, laboratory on improved processes for making the metal. Crane Co. can turn out a ton a week in its new Chicago pilot plant.

Metal Hydrides, Inc., of Beverly, Mass., reduces ground rutile or titanium dioxide pigment with calcium hydride, producing over 1,500 lb. per week of a powdered form that's about 98.5 percent titanium. It sells for about $7 per lb. Powders of 99.5 percent titanium have been made with special equipment.

CANADIANS TOO

In Canada, Dominion Magnesium, Ltd., at Haley, Ontario, is reported to be making the powdered metal from commercial pigment-grade titanium dioxide by calcium reduction. Dominion sells the powdered metal for $4 a lb. Also in Canada, Quebec Iron & Titanium Corp., two-thirds owned by Kennecott Copper Corp. and one-

FABRICATION Here bar of alloy is butt-welded into a ring for GE jet engine.

APPLICATION Jet engines take biggest bite of titanium, 500 to 1,500 lb. each.

third by New Jersey Zinc Co., is smelting ilmenite ore from the vast Lac Tio deposits in its new plant at Sorel, Quebec, to produce pig iron and a slag rich in titanium dioxide. Production of titanium metal from Sorel slag, while probably far in the future, cannot be wholly discounted.

BIG TWO

Far and away the biggest producers now, however, are Du Pont and Titanium Metals. Du Pont's new semi-commercial plant at Newport, Del., will be producing at the rate of 600 tons a year of titanium metal by early 1952. It wouldn't be surprising if Du Pont just about doubled that rate of output shortly thereafter. And it's an odds-on bet that Du Pont will soon be building that big new plant the government wants.

Currently, sponge metal is coming from National Lead plants at Sayreville, N. J., and Boulder City, Nev. The metal is melted into ingots at Allegheny Ludlum's plant at Watervliet, N. Y., and finished into sheet, strip, bar, rod, wire, forgings and extruded shapes at this plant and at Brackenridge, Pa., West Leechburg, Pa., and Dunkirk, N. Y., as well as at the plant of its Forging & Casting Division in Detroit. These plants will also finish the ingots produced in the new Henderson, Nev., facilities.

TOUGH TO MELT

Melting sponge titanium, which resembles gray coke, and converting it into ingots presents tough problems. One reason is titanium's affinity for absorbing gases and the fact that traces of impurities drastically alter properties. Another difficulty is that molten titanium combines with practically every known refractory.

Allegheny Ludlum arc-melts with multiple electrodes in a water-cooled copper crucible under an inert blanket. At the new Henderson, Nev., plant titanium metal will be melted into ingots weighing 1,000 to 2,000 lb., with larger ingots likely later.

NEW FURNACES

Du Pont engineers have also tackled this problem of melting the sponge titanium into ingots. They've designed two special furnaces, one an arc furnace that casts continuously, the other an induction furnace that makes single ingots. Both furnaces are big enough to approach commercial proportions. In the induction furnace more than 15 tons of metal have already been melted, and alloy ingots up to 650 lb. are now being cast. Six such furnaces are now under construction or in operation in the metals industry, and one fabricator reports making ingots as large as 1,000 lb. For induction melting, Du Pont uses a graphite crucible and an atmosphere of argon.

Du Pont's new arc furnace, which employs a tungsten electrode, may hold a key to the continuous melting and casting of titanium. It's the first such furnace in the titanium industry to have this advantage. In it ingots can be formed continuously from molten metal, then cut to required lengths.

FABRICATING

Once in ingot form, titanium is not too hard to handle. Among the companies that have worked with it successfully are Titanium Metals, Rem-Cru Titanium, Inc., Republic Steel Corp., Mallory-Sharon Titanium Corp. and International Nickel Co., Inc. Rem-Cru is owned by Crucible Steel Co. of America and Du Pont. These companies have turned titanium ingots into a variety of sizable semi-fabricated pieces including sheets, strips, wire, rods, tubing and forgings.

Titanium is tough to machine and is rough on grinding wheels. But there shouldn't be too much trouble in welding, forging or extruding it. In rolling sheet and strip, the metal will have to be hot-worked, probably followed by a cold finishing operation. Experts say that, as more is learned about its characteristics, titanium should become even easier than stainless steel to work.

PRODUCING TITANIUM

How is it made? So far, most producers stick pretty close to the basic Kroll process, but there have been plenty of modifications and improvements. As adapted by the U. S. Bureau of Mines for commercial production, the Kroll process consists of reducing the titanium tetrachloride with molten magnesium in an inert atmosphere to raw titanium metal. Magnesium chloride is formed at the same time. Most of this magnesium chloride, together with excess magnesium, is tapped off in liquid form; the rest is either distilled off under vacuum or

leached out with dilute hydrochloric acid. Yields run over 90 percent. But this is a cumbersome batch process, hence the $5 price tag on a pound of sponge.

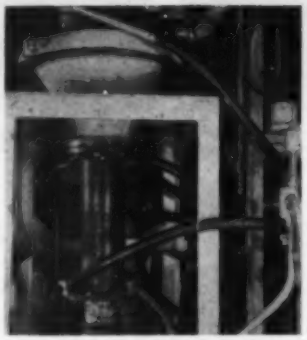
Du Pont gets ilmenite ore from its Florida deposits. At Edge Moor, Del., this is chlorinated to the tetrachloride, then at Newport, Del., it's reduced with magnesium to the sponge.

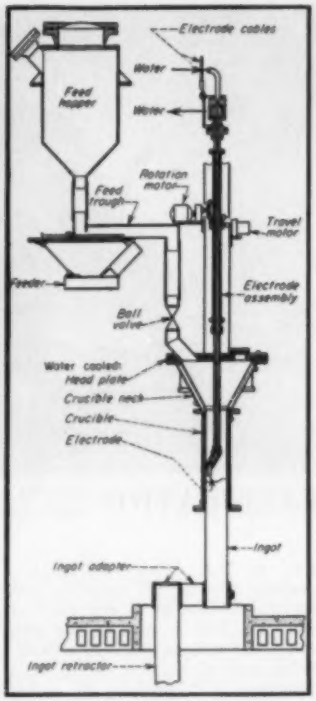
National Lead makes some titanium tetrachloride for its own use, has also been getting it from Stauffer Chemical Co. Crane Co. will also start its Chicago pilot-plant operation with Stauffer's tetrachloride. Stauffer makes the tetrachloride from National Lead's titanium cyanonitride.

Raw materials at Titanium Metals' big plant at Henderson, Nev., will be chlorine, magnesium and titanium ores. Rutile, almost pure titanium dioxide, comes primarily from high-grade deposits in Florida and Australia, or may come from lower-grade deposits scattered through the Far West. Ilmenite is a more complex titanium oxide associated with iron ore. National Lead owns and operates the biggest ilmenite mine in the United States at Tahawus, N. Y.

At Henderson, Titanium Metals will reduce the oxide in the ore by a thermal-chemical batch process. The oxide will be combined with chlorine to produce titanium tetrachloride. This, in turn, will be reduced with molten magnesium to the raw metal. Both magnesium and chlorine can be partially recovered electrolytically from the magnesium chloride. The Henderson plant, according to Titanium Metals, will be the first specifically engineered for titanium production and will incorporate technical advances far beyond current practice.

High-purity titanium metal can be produced by the decomposition of titanium iodides on a hot filament. But this method is too expensive for practical commercial use.





ARC FURNACE designed by Du Pont forms ingots continuously from molten titanium, then the ingots are cut to required length. Furnace uses a tungsten electrode.

PROPERTIES

Virtue of titanium lies in its combination of three properties—strength, light weight and corrosion resistance. It's about twice as heavy as aluminum and almost three times as strong, five times as strong as the magnesium alloys, about half the weight of steel and about as strong as many steel alloys. In salt water, it resists corrosion better than aluminum, stainless steel and all other metals and alloys of general engineering significance.

Titanium is highly ductile. It can be used at higher temperatures than aluminum alloys. But, despite its high melting point (3,160 deg. F.), all of its alloys currently in production lose strength and become brittle after continued exposure above 1,000 deg. F.

USES

New uses, from disks for metering gages to heavy compressor forgings, are coming out of the blue-sky stage and going into production. Some enthusiasts feel that low-priced titanium could crack the pots-and-pans market. It's heavier than aluminum, but since it's stronger, utensils could be made thinner. Titanium might move in even faster in railroad car structural parts, auto bright work and trim, and chemical processing equipment like vessels, piping and valves. That may be one reason for the entry of Crane into titanium.

PROCESS EQUIPMENT

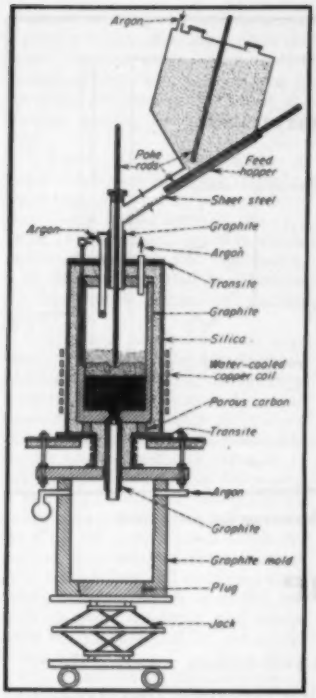
Despite laboratory results reported by Titanium Metals that show titanium highly susceptible to sulphuric acid, service tests by a large chemical company proved it far superior to stainless steel for sulphuric concentrations as high as 22 percent at elevated temperature and pressure. As a result, the company is building a large operating unit made entirely of titanium. Another production unit under construction involves ferrous chloride, and a large pharmaceutical concern is using titanium tubing for process equipment.

The AEC, which uses liquid metals in various reactor systems, is very interested in titanium. It is exploring the possibilities of a titanium vessel for molten metals.

Unlike private industry, the government goes ahead on a cost-doesn't-matter basis when it feels a material is vital. That's why it is using titanium even at present prices, in relatively small quantities, for research and prototypes. If titanium's price should drop to around $1 a lb., the armed services would rush to put it to work.

JET ENGINES

There are many promising uses in jet and gas turbine engines for aircraft. Titanium has withstood tests in firewalls, shrouds, baffles, complete compressor sections, afterburners and diaphragms, where its big advantage over aluminum is high strength in the 500-deg.-F. range and its advantage over stainless steel is in weight saving. A 0.015-in. thick sheet of stainless steel



INDUCTION FURNACE makes single ingots up to 650 lb. at Du Pont's Newport, Del., plant. Industry can make 1,000-lb. and bigger ingots in furnaces like this.

weighs 0.60 lb. per sq. in.; a titanium sheet of the same thickness weighs only 0.35 lb. per sq. in. Titanium alloys are specified in designs for jet engine compressors, where operating temperatures up to 500 deg. F. are encountered. Using titanium instead of stainless steel might lighten a jet engine by 300 lb. That's equivalent to about 50 gal. of fuel. It's even possible that use of titanium might cut the weight of a jet engine as much as one-third or one-half. Titanium can also be used in aircraft landing gear, propellers, armor, skin and internal construction. As one Air Force general says, titanium has no equal in a combat plane. It's also being tried in classified components of rockets and guided missiles.

WHY NAVY WANTS IT

Titanium's resistance to salt water corrosion makes it a natural for shipboard use; the Navy is hot about Horizons Titanium's new process. Brine has been known to attack stainless steel in certain cases; titanium can stand the gaff. A few parts the Navy would like to make of titanium are: snorkel tubes for submarines, valve seats, heat exchangers, condenser piping systems, pump shafts, small propellers and propeller shafts, and steam turbine blading. Because it's lighter, if titanium replaced steel, bigger ships could be built. There's even some wild talk of titanium carriers and battleships.

WEAPONS AND EQUIPMENT

Army Ordnance, thinking of weapons and equipment that can be air-transported and maneuvered easily in the field, wants to use titanium because of its lightness. A case in point is the 81-mm. mortar base plate, which, it has been shown, can be made of titanium instead of steel. Made of titanium, the plate can be of one-piece construction and weighs about 24 lb. The standard steel plate is made in two pieces, each weighing 24 lb. and each carried by one man. The rest of the weapon is carried by a third man. With the titanium plate, the mortar can be handled by a two-man crew. For sky troopers hitting the silk, it would be mighty reassuring to know that lightweight close-support weapons, field pieces, light tanks and other equipment made of titanium were following them into the drop zone.

Col. Benjamin S. Mesick, who is commanding officer of the Watertown Arsenal, big Ordnance metallurgical research center in Massachusetts, where work on titanium is being pushed, says that titanium alloy may possibly be substituted "thickness for thickness for alloy steel armor, reducing armor weight by about 40 percent."

ALLOYS

The future of titanium lies in its alloys. The "commercially pure" titanium being sold at present, in fact, is an alloy containing 99.5 percent titanium. The silvery gray metal can be alloyed with iron, oxygen, chromium, magnesium, manganese and aluminum. Molybdenum is also considered a good bet. A total of 5 to 10 percent of alloying elements is usually added. Alloying increases titanium's strength. Crane Co., among others, is actively exploring the alloying possibilities of the new metal.

PRICE

Titanium metal prices currently are about $6 a lb. for forgings, bar and rod, and $15 a lb. for sheet and strip, an average of about $21,000 per ton for all products. It's expected that these prices will come down as new plants and new production technologies supplant today's pilot-plant operations.

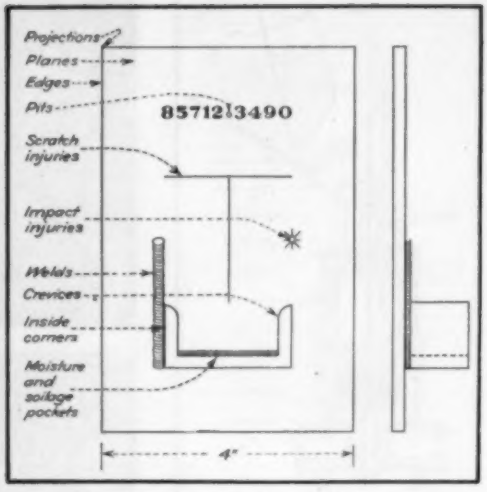
SUPPLY AND DEMAND

There's plenty of titanium in the ground. It's the ninth most abundant element in the earth's crust. And there is certainly a big enough demand for it. The present problem is to chop down the cost of producing it so that it can be sold more cheaply.

Even though output of the metal increases, the government will continue to siphon off almost all of it for defense. Aware that the 5,000 tons or better that are coming next year will be snapped up, industrial buyers are clamoring, "When do we get more?"

FUTURE

The answer, and the future of titanium as the middleweight champ among structural metals, will be in direct reduction from the ore or from a slag rich in titanium dioxide by a continuous thermal process or possibly an electrolytic one. As metals go, titanium is still pretty expensive to produce at $5 per lb. for sponge. But remember that only 63 years ago Charles Martin Hall was starting electrolytic production of aluminum at, coincidentally, just $5 a lb.



All common surface characteristics which promote early paint failure are incorporated in this coating test panel which . . .

Cuts Paint Evaluation Time

NEW TEST PANEL—1. Specifies improved paint systems well within a year's time.
2. Performs screening and elimination functions simultaneously.
3. Cuts time for elimination panel testing by 50 to 75 percent.

The new test panel will also provide a breakdown of coating performance over various types of surface irregularities, more reliable correlation between panel and plant performances, and insight into some of the physical characteristics of the coatings which account for their performance behavior.

PURPOSE OF ANY EVALUATION

Any well-designed paint evaluation program must necessarily be set up to accomplish three functions:

Screening—Weed out coatings which are unsuited for the intended exposure with a minimum of time and effort.

Elimination—Comparatively evaluate the suitable materials to reduce the number of these to a few of greatest promise.

Selection—Comparatively evaluate the few best materials under actual use conditions to determine their actual service life performance.

KENNETH TATOR, AUTHOR, IS HEAD OF THE FIRM OF KENNETH TATOR ASSOCIATES, COATING CONSULTANTS, CORAOPOLIS, PA.

CONVENTIONAL PROCEDURE

These three functions are usually carried out as three distinct testing steps or stages. Screening is accomplished in a laboratory by submitting each coating to arbitrary tests. These are normally immersion in selected reagents or their vapors, impact, abrasion and weathering tests.

Those coatings which pass the laboratory screening tests are exposed to failure on panel exposure racks set up at one or more selected locations within the plant. Customarily the panels are flat steel plate with the edges and corners carefully rounded or masked.[4,5]

A few coatings showing the longest protective life on the panel exposure elimination test are used for painting of plant structures and equipment and their performance histories recorded. From these latter records final selection is made and maintenance painting standards established. These testing sequences and procedures have been recently described in detail by C. C. Harvey[4] of the Ethyl-Dow Corp. and J. P. Barrett[5] of the Stanolind Oil and Gas Co.

Experience with these tests procedures indicates that a two to three-year test program is required to produce sufficiently significant results to justify application to plant equipment and structures for the final selection stage of evaluation. The three year figure has been recently confirmed by the results by O. K. Sieplein[6] of his paint evaluation program conducted at the Dow Chemical Co. Cost for such a program is shown by Barrett to approximate $9,000 for the first year and $5,000 for each of the remaining years. Such a program, although costly, can be justified from an economic consideration.[5]

NEW METHOD

In designing a simplified test method, called the KTA method, the above evaluation procedures were critically examined with the following conclusions:

1. Laboratory screening test stage is required only because it provides a more rapid method of eliminating unsuitable coatings than either the panel elimination or the plant equipment selection stages.

2. This screening is done by study of the performance of a coating under

a series of arbitrary and artificial severe exposures which, depending upon the skilled selection of the designer may or may not bear any close relation to the plant environment in which the selected coating will be ultimately used.

3. Good coating performance on panel elimination tests have too many times been reflected by poor performance of that same coating in plant use under identical conditions of exposure, surface preparation and application. J. B. Scott[1] of the Phillips Chemical Co. has recently pointed out this deficiency.

4. Flat test panels in which edge failure is conventionally minimized by rounding, masking, or disregarding, represents the ideal surface for maximum coating life. Hence any coating elimination test using such panels will require many months of exposure to develop significant coating differences.

In order to shorten this panel exposure time trial designs finally evolved the KTA test panel, shown above. All surface characteristics which promote early paint failure and which are commonly encountered on or in the surfaces of plant structures and equipment are incorporated in the design of this panel.

The panel can be uniformly reproduced on jigs without excessive fabrication costs. It includes sharp and rounded edges, projections, rough welds and spatter, pits, crevices, inside and outside corners, and moisture and soilage pockets. After coating, score lines exposing base metal and impact injury are incorporated. Each of these points of early failure are separated by at least 1 in. of plane surface so that the effect of each point causing early coating failure is separately identifiable. Where regular frequent inspections are possible a 4 × 6 in. panel has proved satisfactory. For less frequent inspections larger panels are preferred wherein each point of early paint failure may be further separated out.

Exposure of the panels is on conventional panel test racks located in the plant area requiring protection, preferably close to the source of corrosive contaminant. Nothing in the panel design or exposure conditions is artificial; all panel surface irregularities and exposure conditions are those found on and around the plant in that same area. Acceleration of results is obtained by the high concentration of points of early paint failure on the panel, as compared with their frequency on plant equipment and structures.

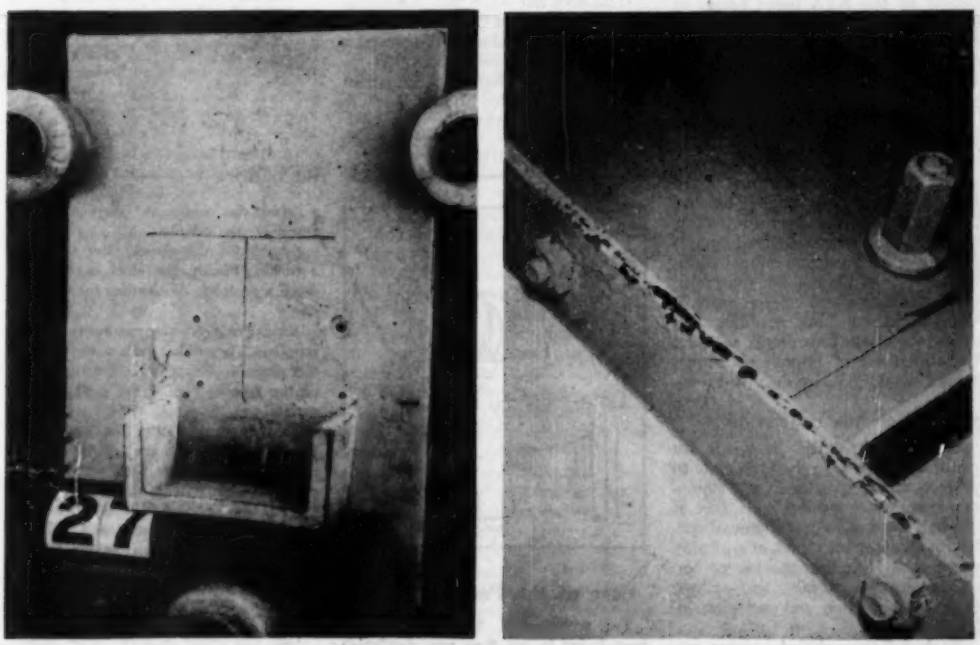
PERFORMANCE CHARACTERISTICS

These panels have been used for 351 individual paint evaluations, during which the performance of 79 paint systems, representing 10 different basic types, have been determined against 17 exposures, mostly chemical-industrial. To correlate these panel results with plant performance 64 applications of selected systems on plant equipment and structures have been periodically examined and recorded. As a result of this exprience the following performance characteristics of KTA panels were determined for the aggressive atmospheric exposures in chemical manufacturing or processing plants:

1. Unsuitable paint systems will fail significantly within an eight-week exposure period, many within four weeks.

2. Very few conventional coating systems will survive a 25-week exposure without showing some significant deterioration.

3. Types and sequences of coating failure found on the panel have accurately predicted the type and sequence of failure in actual plant use. An example is shown by the above comparison. The figure on the left shows failure on a KTA panel after five weeks halide exposure and on the



New panel can predict types and sequences of coating failure. Above example shows panel after 5 weeks' exposure in an acidic halide atmosphere, and same paint system and surface preparation after 2 years on plant equipment in the same atmosphere. Panel shows inability of this paint to give complete protection over sharp edges, welds, and surface projections.

right is the same surface preparation and system after two years plant service.

4. Estimation of paint life in plant service may be made by ratioing time-to-failure at appropriate panel areas to time of early deterioration at some irregularity on the painted plant equipment or structure. By this method prediction of the protective life of any applied paint film may be made within six months after the initial plant application and may be factored to determine life on other types of structures and equipment in the area.

5. By observing those points on the panel which remain protected and those which cause early failure each coating may be classified in respect to its wetting, penetration, continuity and permeability. These characteristics are often useful in devising improved formulations or systems.

Use of this KTA panel therefore makes possible the reliable evaluation and selection of durable paint systems for chemical plant maintenance in much shorter time and with less expense than procedures used heretofore. Rapid panel elimination of unsuitable coatings dispenses with the necessity for laboratory screening tests and the question whether the artificial laboratory exposures are significant of plant conditions. Accelerated failure caused by the KTA panel halves or quarters the time required for significant results on the panel exposure racks, and with proper interpretation is a more reliable index of ultimate plant performance.

A large chlorine-alkali plant in which the KTA evaluation method was employed standardized on improved paint systems within seven months, with savings in maintenance painting costs of 30 percent. Costs of the program approximated only 5 percent of their original annual painting costs even though the routine of panel fabrication and coating, installation, inspection and recording was done by outside consultants in order that functions of normal plant personnel would not be disturbed.

NEED FOR BETTER EVALUATION

Two billion dollars is spent for painting each year in the U. S. only to protect metal structures and equipment against corrosion.[1] Its cost is one-half the nation's total annual outlay for all accepted means of corrosion prevention, including the use of corrosion-resistant metals and alloys, cathodic protection and corrosion inhibitors.

Each full-time skilled painter employed in your plant costs your company $6,000 a year for only direct labor and materials, and many manufacturing plants have 20 or more such painters on their maintenance payroll. If your painting practices are no better or worse than the nation's average your company is spending $14 per gal. of paint for your painting program and for the chemical industry this may run as high as $30 per gal. The labor of application is the largest part of any painting cost, averaging $2.50 for labor to apply paint worth $1.

It requires just as much labor, often more, to apply a cheap paint as it does a high quality material. The per-gallonage cost of painting with a $2 per gal. house paint is $12, whereas the cost of painting with a well-designed $4 per gal. paint is $14. Not as an attractive over-all savings as it first appeared! Frankly it is not a savings at all, but a procedure which will ultimately increase your paint and painting costs several-fold. Your annual costs for a good paint which will give protection for four years without repainting are only $3.50 per gal. applied, whereas a cheap paint lasting but two years costs $6 per gal. applied. Even from the viewpoint of the purchasing department annual paint material costs alone will be $2 per gal. for the cheap paint and $1 per gal. for the good quality material.

This does not mean that substantial savings cannot be made in your painting program. Reduction in costs is not through procurement of less expensive materials but by procurement of materials selected and designed to give maximum service life.

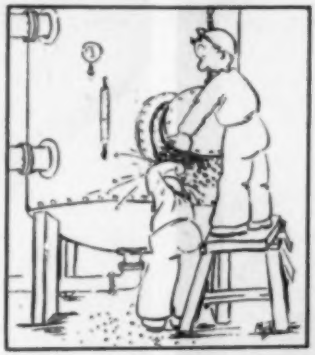
In order to attain these savings, potential to a greater or lesser degree in all manufacturing plants and of real magnitude in all chemical manufacturing and processing plants, it is necessary to intelligently select from the literally thousands of proprietary paint formulations on the market those few which will give maximum protection in your particular corrosive environments. All manufacturing plants can point to paint tests which they are conducting. These too often are not intelligently planned, regularly inspected, adequately recorded, properly comparative, nor correctly interpreted. As a consequence their records, if not lost, are usually inaccurate and misleading.

Potential savings of 20-50 percent of current maintenance painting costs are available in most chemical manufacturing and processing plants through proper selection and use of paints.

REFERENCES

1. Uhlig, H. H., "The Cost of Corrosion to the United States," *Corrosion* **6**, 29 (Jan. 1950).
2. "Report of Sub-committee on Standard Methods of Conducting Service Tests," Proc. Am. Soc. Testing Materials, **5**, 83 (1905).
3. "Report of Sub-committee XXIX on Preparation and Paint of Structural Iron and Steel", Proc. Am. Soc. Testing Materials, **41**, 322 (1941).
4. C. C. Harvey, "Selection of Protective Coatings for Fume Resistance," *Corrosion*, **6**, 323 (Oct. 1950).
5. J. P. Barrett, "A Method of Selecting Protective Coatings for Off-Shore Drilling Structures," *Corrosion* **6**, 376 (Nov. 1950).
6. O. K. Sieplein, "Dow Draws Conclusions from Three Year Paint Study, *Chem. Eng.*, Oct. 1950, p. 110.
7. J. B. Scott, "How to Protect Your Steel", *Chem. Eng.* Apr. 1951, p. 135.

LITTLE BONERS



Case of the Packed Tower

For several days, the engineers had been trying to get their new distillation column to operate as it should. No matter what, the best they could get was only a trickle of condensate even with full steam on the reboiler.

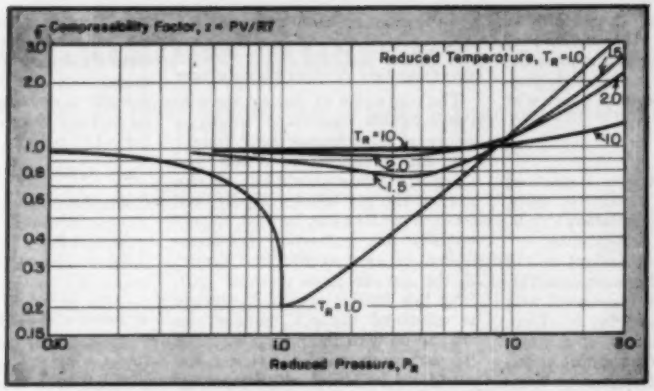
Speculation ran amuck. But still only a trickle. Finally, the chief engineer ordered a complete dismantling for the next day.

Several of the young engineers weren't satisfied. They didn't believe the column was plugged. Could it be that the source of the trouble was at the heat transfer surface?

So they worked late that evening to find out. When they took off the bottom flange of the reboiler they were literally showered with Raschig rings.

"You see," one of them tells, "we had asked for a packed column and had gotten one; it was packed from top to bottom above and below the retaining plate, completely down to the bottom of the reboiler."

Can you recall a true "little boner" from your own experience? Why not send it in? Address the Editor, Chemical Engineering, 330 West 42nd St., New York 18, N. Y.



An advantage of the z-compressibility factor is that it can be generalized to one chart as above, by the use of reduced conditions of temperature and pressure.

Converting to z-Compressibility

Of all the gas compressibility factors, the z-factor is most useful to chemical engineers. But the various handbooks and references often report compressibilities differently. So you should know how to convert to the more useful z-factor.

KENNETH A. KOBE

When the chemical engineer gets into gases at high pressures and low temperatures, he finds that the ideal gas laws no longer hold. He has to use a compressibility factor that will make his calculations agree with experiment. When he turns to the handbooks or the original literature, he finds a variety of symbols all representing compressibility factors, such as z, A, C, F, κ, λ, μ, and others. Are these just different symbols for the same thing, or are there different ways of expressing compressibilities?

On investigation he finds that these are a number of definitions for compressibility, but of these one, the z-factor, is most useful for his engineering calculations. The scientist doing the experimental work may use the A-unit or F-unit for expressing his results. The engineer must be familiar with all systems so that he can convert.

THE COMPRESSIBILITY FACTOR

The chemical engineer usually prefers a compressibility factor, z, defined as:

$$pV = znRT \qquad (1)$$

The z-factor is an "efficiency factor" in the ideal gas law equation that will make the equation give the correct p-V-T relationships for the actual gas. It is a dimensionless factor, with a value of 1.000 at zero pressure when the gas behaves ideally. At the critical point ($p_r = 1.0$, $T_r = 1.0$) of a gas the behavior is quite non-ideal, and z has a value of about 0.20 (see cut), showing that the actual gas has been much more compressible than would be indicated by ideal behavior. As the reduced pressure increases to a value of about 9, the value of z again becomes about unity and above this point the compressibility factor is always greater than unity, showing that the actual gas is less compressible than would be indicated by ideal behavior.

The compressibility factor appears to have been introduced first by Hougen and Watson[6] who state that it is a function of the temperature, pressure, and nature of the gas. Cope, Lewis and Weber[7] introduced the idea that the compressibility factor (called μ by them) can be generalized for hydrocarbons when reduced temperatures and pressures are used. Their graph shows z plotted against p_r/T_r. Brown, Souders and Smith[4] prepared a generalized chart for z plotted against p_r for a number of reduced isotherms (constant T_r). Dodge[8] prepared a generalized compressibility chart based on a number of gases rather than hydrocarbons alone. Such a chart can be used for any gas if its critical temperature and pressure are known so that values of reduced temperature and pressure ($p_r = p/p_c$, $T_r = T/T_c$) can be used to get the value of z. Newton[9] showed that for hydrogen, helium and neon it was necessary to add 8 deg. K. to the critical temperature and 8 atm. to the critical pressure to make the p-V-T properties of these gases follow the generalized chart. Later workers have prepared more accurate generalized charts as more p-V-T data have become available (see cut).

To the engineer the z-factor has the advantage because it is a dimensionless multiplier that can be used in the ideal gas law equation regardless of the units being used, and because it can be generalized to one chart by the use of reduced conditions of temperature and pressure.

THE AMAGAT UNIT

It was early (1799) recognized that gases deviated in their behavior from that predicted by Boyles Law (1662) and considerable experimental work was done to determine the extent of the deviation.[10] The most outstanding of these early workers was E. H. Amagat, who determined the compressi-

KENNETH A. KOBE is *head of the department of Chemical Engineering at the University of Texas, Austin.*

bility of many gases at pressures as high as 3,000 atm. His results were expressed in the form of a ratio of the pV product of the gas at high pressure to that at atmospheric pressure at 0 deg. C.

$$A = pV/p_1V_1 \qquad (2)$$

The product p_1V_1 at $p_1 = 1$ atm. and 0 deg. C. is given a value of unity, $p_1V_1 = 1.0000$, and the ratio pV/p_1V_1 is usually called the Amagat unit.

Unfortunately, the Amagat unit is frequently called the compressibility of the gas and hence is confused with the compressibility factor, z. Thus, the Chemical Engineers' Handbook[11] gives tables of "compressibility factors" for various gases, which on closer inspection are seen to be Amagat units. The Amagat unit is recognized by the designation at the top of the table: "PV = 1.0000 at 1 atm. and 0 deg. C." or within the body of the table the value 1.000 appears in the row and column for 1 atm. and 0 deg. C. Because the pV product may be at any temperature, whereas p_1V_1 is always at 0 deg. C., the Amagat unit takes into consideration the effect of temperature and corrects for it. The volume at any designated temperature and pressure can be calculated from any set of initial values and the Amagat units at the initial and final conditions.

$$p_1V_1 = p_2V_2/A_2 = p_3V_3/A_3 \qquad (3)$$

$$V_2 = V_1p_1A_2/p_2A_2 \qquad (4)$$

In order to go from mass units to volume units it is necessary to know the density of the gas, preferably at 0 deg. C. and 1 atm.

Although it may appear to the chemical engineer that the use of Amagat units is confined to values taken from the older literature, as the International Critical Tables[7] and elsewhere,[8] he will find these units used in research work reported at the present time, particularly from European laboratories.[9] It is therefore essential that he understand this system of reporting compressibilities and be able to convert it to the compressibility factor, z, which he usually uses.

A variation of the Amagat unit may be found in the literature. Pickering[12] defined a factor, F, in the following manner:

$$F = pV\,273.1/T \qquad (5)$$

In this factor, the Amagat unit is reduced to the temperature 0 deg. C. When gas volumes are corrected from one set of conditions to another, it is necessary to include a temperature term.

$$V_2 = V_1p_1T_2F_2/p_2T_1F_1 \qquad (6)$$

Eq. (6) may be compared with Eq. (4).

CONVERSION OF A-UNITS TO Z-FACTORS

The conversion of Amagat units to compressibility factors is simply a change of the reference point from 1 atm. and 0 deg. C. to 0 atm. and 0 deg. C. Under conditions of zero pressure the gas behaves ideally, and the ideal gas laws may be used. Experimentally this conversion is accomplished by extrapolating the density of the gas to zero pressure (p_o). From this limiting or ideal density can be calculated the p_oV_o product for comparison with the p_1V_1 product. A different compressibility factor, λ, was introduced by Guye[5] which measured the deviation of the gas from the law of Avagadro. For pressure of 0 and 1 atm. at deg. C. it gives the following relationships for volume and density:

$$1 + \lambda = p_0V_0/p_1V_1 \quad d_0 = d_1/(1 + \lambda) \qquad (7)$$

Some values of this λ-factor are given in the Chemical Engineers' Handbook.[11]

Molal Volume of Gases at 0 deg. and 1 atm.

Gas	$1 + \lambda = \frac{p_0}{p}$ (0°, 0 Atm.) / (0°, 1 Atm.)	$\frac{22,414.1}{1 + \lambda}$ (Cc./Mole)
Acetylene	1.010	22,192
Air	1.0005	22,401
Ammonia	1.015	22,081
Carbon dioxide	1.0007	22,394
Carbon monoxide	1.0005	22,404
Ethylene	1.0078	22,240
Hydrogen	0.99939	22,428
Methane	1.0024	22,360
Methyl chloride	1.0244	21,880
Nitrogen	1.00047	22,404
Oxygen	1.0009	22,393
3:1 H_2-N_2	0.99960	22,422

Although these values show that the deviation from ideality is small for these gases, larger values are found for other gases, as 1.042 for butane.

For a gas at 0 atm. and 1 atm. at 0 deg. C. a unique relationship exists:

$$1 + \lambda = p_0V_0/p_1V_1 = A_0 = 1/z_1 \qquad (8)$$

From the second column of the table we can obtain the Amagat unit of the gas at zero pressure (ideal gas) and this value is the reciprocal of the compressibility factor of the gas at 1 atm. pressure and 0 deg. C. This is again indicated by the following equation:

$$\frac{p_0V_0}{p_1V_1} = \frac{nRT_0}{z_1nRT_0} \quad A_0 = 1/z_1 \qquad (9)$$

For any conditions another set of equations can be written:

$$p_2V_2/p_1V_1 = z_2nRT_2/z_1nRT_0 \qquad (10)$$

$$A_2 = z_2T_2/z_1T_0 \qquad (11)$$

$$z_2 = A_2p_1\,273/T_2 \qquad (12)$$

The value of z_1 can be calculated as the reciprocal of $1 + \lambda$ (Eq. 8), or from the density of the gas. For many calculations the value of z_1 is sufficiently close to unity so that it may be assumed to be unity, in which case Eq. (12) reduces to a simpler form:

$$z_2 = A_2\,273/T_2 \qquad (13)$$

Comparison shows that Eqs. (13) and (5) are identical. It must be emphasized that Eq. (13) is only an approximation, where as Eq. (5) is a definition.

AVOIDING CONFUSION

Considerable confusion has resulted because of the use of A-units and z-factors, both called compressibilities. No one working with either system alone has difficulties, but when reference texts and the literature do not differentiate clearly between the two, confusion will result unless care is used to ascertain which compressibility is being used. A company research bulletin published recently[13] defines a compressibility factor F first by $pV = FRT$, then by $(pV/p_1V_1)_T =$ const. and finally by Eq. (5). A compressibility chart is then prepared based on the property of the gas at psia., rather than 1 atm. as used for A or F-units, or zero pressure as used for z-factors. When material is presented in a manner such as this, it is easy to see how confusion concerning compressibilities prevails among some engineers. Such difficulties can be avoided by explicit definitions and careful terminology when dealing with actual gases.

And remember that the z-factor is the most advantageous to the chemical engineer for his ordinary process calculations.

REFERENCES

1. Brown, G. G., Souders, M., and Smith, R., *Ind. Eng. Chem.*, 24, 513-8 (1932).
2. Cope, J. Q., Lewis, W. K., and Weber, H. C., *Ind. Eng. Chem.*, 23, 887-93 (1931).
3. Curtis, H. A., *"Fixed Nitrogen,"* pp. 246-50, New York, Chemical Catalog Co., 1932.
4. Dodge, B. F., *Ind. Eng. Chem.*, 24, 1353-62 (1932).
5. Guye, P. A., *J. Chim. Phys.*, 6, 769-807 (1908).
6. Hougen, O. A. and Watson, K. M., *"Industrial Chemical Calculations,"* First Edition, pp. 57-61, 71-75, New York, John Wiley & Sons, 1931.
7. *"International Critical Tables* III," 3-20 (1928).
8. Michels, A., Geldermans, M., and deGroot, S. R., *Physica*, 12, 105-17 (1946).
9. Newton, R. H., *Ind. Eng. Chem.*, 27, 302-6 (1935).
10. Partington, J. R., *"An Advanced Treatise on Physical Chemistry,"* pp. 553-77, London, Longmans, Green & Co., 1949.
11. Perry, J. H., *"Chemical Engineers' Handbook,"* pp. 385-9, New York, McGraw-Hill Book Co., 1950.
12. Pickering, S. F., Nat. Bur. Standards (U. S.), Circular 279 (1924).
13. Worthington Pump and Machinery Corp., Harrison, N. J., Research Bulletin P-7637 (July 1949).

Turnover Ratios Analyzed

Factors which influence the ratio of sales value to plant investment for chemical products.

GORDON KIDDOO

In the May 1951 issue of *Chemical Engineering* (pp. 164-5), capital investments, expressed in dollars per annual ton of capacity, were given for a number of chemical manufacturing operations. No high degree of accuracy for these investment figures was claimed. Where data were available over a range of plant sizes for a particular product, the author chose the unit cost at the middle of the range. For this reason, the unit cost over the range might vary two-fold or more from the smallest to the largest plant. These investment figures are, however, of the correct order of magnitude for the processes involved and are adequate for very rough calculations.

In any commercial enterprise, one of the usual criteria for judging economic attractiveness of the operation is the ratio of annual sales to capital investment. It is often said that, in general terms, the most attractive chemical ventures are those for which the annual sales exceed the capital investment. This ratio can also be expressed, of course, in terms of sales value per ton of product and plant investment per annual ton of capacity. It is commonly known as the turnover ratio.

Sales value, expressed in dollars per ton, has been computed for each chemical for which the approximate capital investment was given. The prices used in computing these figures were the average of the *Oil, Paint and Drug Reporter's* prices, given in the annual review numbers published in January 1950 and 1951. It is recognized, of course, that many of the *OPD* prices are spot market prices and do not represent the average prices paid for many of the chemicals in question. Some may be sold on long-term contracts at prices either above or below the spot market prices. In general, the fluctuation in spot market prices is much greater than is the fluctuation in contract prices, and the *OPD* prices are sometimes too high or too low. Nevertheless, the average of the quoted prices

(*Continued on page 148*)

GORDON KIDDOO, *a frequent contributor to CE, is assistant director of National Research Corp.'s petrochemicals department in Cambridge, Mass.*

Process	Investment, $/Annual Ton of Capacity	Product Value (Sales) $/Ton	Turnover Ratio
Group I—Processes with moderate to high turnover ratios			
Benzaldehyde via chlorination	960	950	0.99
Methyl methacrylate resins	740	815	1.10
Polyvinyl chloride ex acetylene	900	700 ('51)	1.27
Synthetic glycerine	560	790	1.41
Pentaerythritol	440	630	1.43
Monoethylamine	360	500	1.39
Phthalic anhydride ex naphthalene	310	430	1.38
Aniline ex nitrobenzene	290	310	1.07
Diphenylamine	290	540	1.87
Ethylene glycol	280	310	1.11
Toluene via hydroforming	280	555	1.98
GR-S copolymer	280	425	1.52
Acetylene via calcium carbide	210	240	1.14
Hydrofluoric acid	190	355	1.87
Acetic anhydride ex acetic acid	180	250	1.39
Oxalic acid via oxidation	180	305	1.70
Acrylonitrile ex cyanohydrin	160	740	4.65
Synthetic nitric acid	150	194	1.29
HAF carbon black	144	155	1.08
Alcohol ex grain	140	144	1.01
Ethylene @ 6¢/lb. ex refinery gas	120	120	1.00
Dialkyl phthalates—diethyl	110	525	4.77
—dibutyl	110	640	5.81
Trichlorethylene ex acetylene	110	215	1.96
Carbon bisulphide	98	130	1.37
Carbon tetrachloride ex hydrocarbons	85	160	1.82
Ammonium phosphate	88	165	1.85
Isopropyl alcohol (95%)	98	130	1.30
Calcium carbide	78	131	1.15
Alcohol ex molasses	78	144	1.83
Sodium bichromate	61	205	3.33
Methyl chloride ex methanol	56	215	3.84
Phosphoric acid via Dorr process	56	95	1.70
Methyl isobutyl ketone	55	240	4.36
Chloroform ex acetone	53	380	7.18
Phenolic resin	45	400 ('51)	8.30
Acetaldehyde ex acetylene	48	200	4.15
Disodium phosphate	44	74	1.68
Urea	44	104	2.36
Acetic acid ex acetaldehyde	44	165	3.75
Ethyl ether	38	225	6.16
Portland cement	19	19	1.00
Sulphur ex low-grade ores	19	18	0.94
37% Formaldehyde ex methanol	17	75	4.40
Contact sulphuric acid ex sulphur	17	20	1.17
Sulphur ex hydrogen sulphide	13	18	1.30
Aluminum sulphate	11	22	2.86
Refined NaCl ex brine	11	21	1.88
Sodium silicate	8.5	18	2.12
Ammonium sulphate	7	39	5.55
Lime	5.6	10	1.80
Group II—Processes with low turnover ratios			
Allyl alcohol	1800	600	0.33
Neoprene	1200	700 ('51)	0.58
Butadiene ex butane	1100	230	0.21
Hexamethylene tetramine	1100	465	0.43
Butadiene ex naphtha and gas oil	960	230	0.24
Butadiene ex butylenes	750	230	0.31
Phthalic anhydride ex ortho-xylene	550	420	0.77
Styrene	540	330	0.61
Synthetic butanol	530	400	0.75
Butadiene ex alcohol	500	230	0.46
Acetylene @ 12¢/lb. via Sebosh	410	240	0.59
Synthetic phenol	400	295	0.74
Ethylene dichloride	360	180	0.51
Furfural	250	160	0.66
Alcohol ex wood waste	280	144	0.51
Alcohol ex sulphite liquor	260	144	0.55
Electrolytic chlorine & caustic	260	115	0.45
Synthetic methanol	240	88	0.37
Acetic acid via alcohol oxidation	240	165	0.69
Synthetic ammonia	220	77	0.35
Phosphoric acid via blast furnace	160	95	0.60
37% Formaldehyde ex hydrocarbons	160	75	0.47
HCl ex salt	150	84	0.56
Kraft paper or newsprint ex pulp	132	106	0.82
Chlorine via nitrosyl chloride	120	51	0.43
Alumina ex bauxite	91	68	0.74
Sulphuric acid ex anhydrite	73	20	0.28
Calcium cyanamide	65	52	0.79
Soda ash	62	22	0.35
Contact sulphuric acid ex pyrites	36	20	0.54
Contact sulphuric acid ex smelter gas	25	20	0.80

New Approach to Payout Calculations

This method allows for: 1. Probability of success or of failure.
2. Effect of increased income tax rates.
3. Future value of income and capital.

JOHN HAPPEL

A simple and widely used index for expressing the economic attractiveness of a proposed commercial venture is the so-called payout time, obtained by dividing the required capital investment by the anticipated gross annual earnings. Low payout times indicate ventures of greatest attractiveness.

The use of this simple index has certain limitations. For one thing, it does not take into account the effect of changes in tax rates. It does not make any quantitative allowance for the probability of success or failure. Nor does it consider the future value of income, depreciation, or investment over the life of the project.

This article will develop quantitative relationships defining the effect of these variables on payout time. You can use these relationships not only in the appraisal of complete projects, but also in the choice between two or more design alternatives. Process and design engineers, as well as management, therefore, will benefit from a study of this development.

What constitutes the maximum attractive payout time for a given type of enterprise? This is largely a matter of judgment based on experience. Several surveys of management policy along these lines have been conducted in recent years.[1, 2, 3] Table I, after Happel and Aries,[3] is based on battery limit investments and gross earnings, neglecting depreciation and taxes.

The high risk values in this table apply to new, untried ventures with uncertain futures. With established processes and markets, the low risk figures apply. These figures are simply a rough guide, as practice will vary from company to company, and even from time to time for a particular company.

The investment involved in Table I is that specifically devoted to the process and installed within battery limits. Offsite investment in utilities, docks, shops, office buildings, roads, etc., is not included. The offsite investment in a complete plant will usually run between 100 and 180 percent of the investment in process facilities. This investment is important, and any final economic evaluation must take it into consideration. However, since it is nearly all salvageable or generally useful even if the process in question fails, the required return on offsite investment is not as high as when only risk capital is involved.

Table I—Maximum Acceptable Payout Times

	Low Risk	High Risk
Industrial chemicals	5	1
Petroleum	3	1
Pulp & paper	5	2
Drugs & pharmaceuticals	3	1
Metals & metallurgy	6	2
Paints, varnishes, & lacquers	3	1
Fermentation products	5	2

Let us assume that the alternative to investing in a proposed risk venture is to buy safe securities which will yield, say, 3 percent per year. Let us also assume that the life of the proposed venture will be 10 years, that inflationary or deflationary trends can be neglected, and that there will be no salvage value for the investment in manufacturing facilities.

The value of our initial investment I after n years, at an interest rate i compounded annually, is given by the expression[4]

$$I(1+i)^n$$

Substituting the assumed values for i and n, we get 1.344 I. The total accrued net earnings which we anticipate from our manufacturing venture, therefore, must be equal to at least 1.344 I at the end of 10 years. If not, the venture would be unattractive.

Let us develop some methods for calculating the value of net annual earned income. Two sets of values must be considered—what happens to annual earnings if the venture is a success, and what happens if it fails. In the event of success, net annual income and depreciation will be paid into a sinking fund to recover the value of the investment. This sinking fund is assemed to be reinvested at 3 percent interest.

Gross annual earnings can be expressed as a function of investment $p_0 I$, where p_0 is a fractional number equivalent to $1/T$, the reciprocal of payout time in years. Multiplying by the factor y, which expresses the probability of success, we get the term $p_0 y I$, an expression of probable gross annual earnings in terms of investment.

Depreciation is paid into our sinking fund at an annual rate which will, at the end of 10 years at 3 percent interest, build up a sum equal to the full initial investment. The annual depreciation rate is calculated as

$$\frac{i}{(1+i)^n - 1} = 0.0872$$

Taxable income is gross income less depreciation, or

$$p_0 y I - 0.0872\, y I$$

and net annual income after taxes will be

$$p_0 y I - (p_0 y I - 0.0872\, y I)t$$

This annual income will accumulate interest as earned each year and result in the following net assets after 10 years:

$$[p_0 y I - (p_0 y I - 0.0872\, y I)t]\frac{(1+i)^n - 1}{i}$$
$$= 11.46(1-t)(p_0 y I) + y I t$$

Alternatively, in considering the effect of failure, it will be assumed that failure occurs completely and at the beginning of the venture. If it be further assumed that the company is large enough so that its tax rate is not

NOMENCLATURE

- I = Investment within battery limits, dollars.
- T = Payout time, years.
- T_M = Maximum acceptable payout time, years.
- R = Gross profit, dollars per year.
- O = Operating earnings, dollars per year.
- i = Safe annual interest rate, fraction.
- p_0 = Gross annual earnings, fraction of investment.
- p_{0M} = Minimum acceptable gross annual earnings, fraction of investment.
- p_N = Net incremental annual earnings above minimum, fraction of investment.
- y = Probability of success, fraction.
- t = Total income tax rate, fraction.
- n = Number of interest periods in plant life.
- m = Investment-dependent operating costs, annual fraction of investment.

JOHN HAPPEL is professor and chairman of the department of chemical engineering at New York University.

affected by either success or failure of an individual venture, it will be possible to take a tax credit, so that the loss is not complete. This credit can be expressed as $(1-y)It$, where $(1-y)$ is the probability of failure. The tax credit will have an accumulated asset value at the end of 10 years of $1.344(1-y)It$.

Earned income plus tax credits must, as pointed out previously, at least equal the appreciated value of the initial investment at the end of the 10-year period. Using p_{om} to designate minimum acceptable rate of gross earnings, we get

$$1.344\,I = 11.46(1-t)(p_{om}yI) + yIt + 1.344(1-y)It$$

Noting that I cancels out, we can solve for y, the probability of success, or for p_{om}, the minimum acceptable gross earnings rate:

$$y = \frac{1.344(1-t)}{11.46(1-t)p_{om} - 0.344t}$$

$$p_{om} = \frac{1.344(1-t) + 0.344yt}{11.46(1-t)y} = \frac{1}{T_M}$$

The relationship between maximum acceptable payout time T_M and probability of success for several different tax rates is shown in Table II. Zero tax rate is used for comparative purposes and for evaluation of government-operated facilities. The tax rate on corporation income 25 years ago was approximately 13 percent. Until recently the federal income tax rate was 38 percent for corporate income in excess of $50,000, and an additional 3 percent, allowing for local and state taxes, brings this figure up to 41 percent. The present excess profits tax allows levies up to 77 percent on corporate profits.

We can make some interesting observations as to the effect of taxes on the attractiveness of new ventures. A very high tax rate, such as 77 percent, is seen to be a deterrent to low risk investments, influencing those of great risk to a lesser degree. Thus with a risk corresponding to a payout time of 5 years in the 41 percent tax rate era, the same risk under excess profits tax of 77 percent requires a payout in 3.5 years. You can see, also, that at a 77 percent tax rate any venture paying out in more than 4.6 years would be less profitable than investing in securities at 3 percent interest.

Table II says that the probability of success associated with an average risk venture, corresponding to T_M of perhaps 3 years at 41 percent tax rate, is 37 percent, indicating that approximately two out of every three new ventures fail. This is not far from the ratio of "discontinued businesses" to "new businesses"[4] for the period 1944-1950. There are obviously many complications in implying that this relationship can be drawn, but it is believed that a statistical approach to this problem may ultimately be of considerable value.

Table II—Effect of Taxes and Risk on Payout Time

Probability of Success	Payout Time T_M in Years $t=0$	$t=0.13$	$t=0.41$	$t=0.77$
0.1106	1.02	1.012	1.00	0.925
0.2448	2.09	2.06	2.00	1.725
0.375	3.20	3.14	3.00	2.42
0.511	4.35	4.27	4.00	3.02
0.654	5.55	5.43	5.00	3.56
1.000	8.53	8.20	7.25	4.58

Table III—Required Payout Times for Incremental Safe Returns

Probable Incremental Return above 0.03, p_N	$T_M=1$	$T_M=2$	$T_M=3$	$T_M=4$	$T_M=5$	$T_M=7.25$	$T=T_M$
0.05	0.59	1.18	1.79	2.41	3.05	4.49	0.39–0.62
0.10	0.41	0.84	1.28	1.72	2.18	3.25	0.41–0.45
0.15	0.32	0.65	0.99	1.34	1.69	2.55	0.33–0.35
0.20	0.26	0.53	0.81	1.11	1.39	2.10	0.26–0.29

Table IV—Economic Selection of Compressor

	Single-Stage	Two-Stage
Theoretical bhp	107.8	92
Actual bhp	134.5	115
Installed cost	$15,450	$17,350
Annual cost of fuel	$1,055	$905
Investment-dependent costs	$5,280	$6,780
Total annual cost	$6,335	$7,680

The analysis described above may be amplified to obtain an expression for the relative attractiveness of risk ventures, based on the maximum acceptable payout times of Table II. Where several alternatives are being considered, we would like to select the one yielding the maximum probable incremental profit above that which could be obtained as a safe investment at 3 percent.

The net probable incremental income, after taxes, would be

$$p_N I = (p_o - p_{om})(1-t)yI$$

Note that depreciation does not enter into this calculation, as it has already been allowed for in the calculation of minimum acceptable income.

The term $p_N I$ is similar to the "venture profit" term used by Happel and Aries[3] which, however, did not include any probability factor. It is believed that $p_N I$, since it includes an estimate of the chance of success, is a better index of the desirability of a proposed venture. Where two alternatives involve the same probability factor, use of either $p_N I$ or venture profit will give the same results.

The advantage of $p_N I$, in dollars, over p_N, rate of return on investment, as an index for comparing two proposed ventures, is that it indicates which venture will yield the greater net incremental profit over the minimum acceptable profit. This permits you to compare the relative attractiveness of ventures in which the investments are not the same.

Where alternatives involving equal investments are being compared, the rate of return p_N is a suitable index. This in turn is related to the ratio of actual payout time to minimum acceptable payout time as demonstrated in Table III, which shows the required payout times necessary to obtain various incremental rates of return above 3 percent net. This table is based on a single tax rate, 41 percent.

As an example of the use of Table III, consider a conservative business operating at an over-all profit rate of, say, 8 percent ($p_o = 0.05$). Any proposed low risk venture, corresponding to a maximum acceptable payout time of 5 years, must actually show a payout time of no more than 3 years if the over-all rate of profit is to be maintained. For a high risk venture, corresponding to a maximum payout time of 1 to 2 years, the indicated payout period from the best preliminary cost estimate would have to be 0.6 to 1.2 years. Note also the column corresponding to no risk, $T_M = 7.25$. For the assumed case 4.5 years payout is shown to correspond to an apparent return on investment of 8 percent.

The same principles that apply to the appraisal of over-all alternatives can be applied to the analysis of the lesser alternatives encountered in plant design work. The general procedure has been described by Happel and Aries.[3] It involves adjusting alternative design variables so that the anticipated incremental safe profit is a maximum. Simplified relationships can be developed, because for any given plant the probability of success y and the tax rate t will be the same for all component parts.

In general, the incremental safe profit can be expressed as follows:

$$p_N I = f(a,b,c,\ldots n)$$

where $a, b, c, \ldots n$ are variables which, considered together, will fix the incremental safe profit. These may be design variables, such as diameter of piping, square feet of heat exchanger surface, or number of plates in a distillation column, or they may be operating variables, such as fractional recovery of one of the products, rate of circulation of a given stream, or pres-

sure drop. Naturally, for variations in operating variables which involve no change in equipment, considerable simplification results. Different selections of appropriate variables will serve conveniently under varying circumstances.

In any case, if the partial derivative of $p_s I$ with respect to each variable is set equal to zero, a set of n simultaneous equations will result:

$$\frac{\delta(p_s I)}{\delta a} = 0; \frac{\delta(p_s I)}{\delta b} = 0; \frac{\delta(p_s I)}{\delta c} = 0; \ldots\ldots \frac{\delta(p_s I)}{\delta n} = 0$$

Solution of these equations will give the value of each of the n variables which will maximize $p_s I$. The method may be applied either analytically, graphically, or in tabular form. The analytical form is, of course, applicable only where $p_s I$ can be expressed in terms of some continuous function, i.e., in a range where no abrupt changes occur in one or another variable.

In practical application the algebraic or analytical formulation is often used when one independent variable serves to define the profit equation. Since $p_s I = R$, the gross profit, and $p_{os} I = I/T_s$, the minimum acceptable profit, incremental profit can be expressed as

$$p_s I = R(1 - t)y - (I/T_M)(1 - t)y$$

For design problems involving investment alternatives in the same plant, if it is assumed that $p_s I$, R, and I are functions of some variable a,

$$\frac{d(p_s I)}{da} = \frac{dR}{da}(1 - t)y - \frac{1}{T_M}\frac{dI}{da}(1 - t)y$$

Setting $d(p_s I)/da = 0$:

$$\frac{dR}{da} - \frac{1}{T_M}\left(\frac{dI}{da}\right) = 0$$

In some cases, it may be more convenient to employ operating earnings $O = R + mI$, instead of gross earnings R. Then term m refers to those items which enter into the normal operating cost of a plant and which are usually expressed as a function of investment, such as maintenance (but not depreciation, which is included in payout time). We then get

$$dO/da - (m + 1/T_M)dI/da = 0$$

Many published methods for economic design calculations either neglect or minimize the term $(m + 1/T_s)I$, annual cost of investment, the authors concentrating their efforts on the selection of the minimum annual operating cost O. Use of the methods developed here will assure that your design calculations have adequate allowances for maintenance, depreciation, taxes, and minimum acceptable return on investment. For other than the usual plant life or different assumptions regarding time of failure of an enterprise, Table II could be elaborated.

As an example of application of the method to plant design, suppose we wanted to choose between a single-stage and a two-stage engine-driven compressor for compressing 600 cfm. of air from atmosphere to 100 psig. Gas consumption of the engines, figured at $0.10 per 1,000 cu. ft., will be 10 cu. ft. per bhp.-hr., and compressor efficiency will be 80 percent. Installed cost of a single-stage unit is $100 per bhp.; a two-stage unit costs $150 per bhp. This installation will be part of a process plant which is expected to pay out in a maximum of 3 years. Maintenance will be 6 percent of investment per year. The compressor will operate 90 percent of the time.

Horsepower can be calculated for each compressor from standard work of compression formulas, then corrected for efficiency. Investment and fuel consumption are both calculated from the actual bhp. Investment-dependent costs are $(0.06 + \frac{1}{3})I$. In both cases it is not necessary to multiply by $(1 - t)y$ because tax rate and the possibility of plant failure are not affected by the variables involved.

We can now set up Table IV to compare the two possible installations. You can see that, although the two-stage unit is favored from the standpoint of fuel cost, the investment-dependent costs are heavily in favor of the single stage unit.

REFERENCES

1. *Business Week*, Jan. 22, 1949, p. 56.
2. Grant, E. L., "Principles of Engineering Economy," 3rd Ed., Ronald Press, New York, 1950.
3. Happel, J., and Aries, R. S., *Chem. Eng. Prog.*, 46, 116 (1950).
4. "Statistical Supplement to Survey of Current Business," Dept. of Commerce, 1949.

TURNOVER RATIOS ANALYZED

(*Continued from page 145*)

are of the correct order of magnitude.

Using the sales value per ton of each chemical, the turnover ratio was computed in each case. The results of these calculations show that chemicals fall into two groups:

Group I—Those for which the turnover ratio is substantially equal to or greater than one.

Group II—Those for which the turnover ratio is appreciably less than one. The results of these calculations and the grouping of chemicals are shown in the table.

In general, it is observed that where annual sales exceed capital investment, one or more of these conditions is true:

1. The raw material represents an important part of the finished cost of the product. This usually means that the raw material is a chemical intermediate which must itself be manufactured in a high investment plant. That is, a relatively expensive chemical raw material is purchased and it is converted, often by a simple process, into a salable product. An excellent example of an operation of this type is the manufacture of 37 percent formaldehyde by the oxidation of methanol. In this case, the bulk of the investment is in the manufacture of methanol, and the oxidation to formaldehyde is a relatively simple process.

2. The manufacture is essentially a mining or extractive operation, often one in which labor costs are important. Examples of this are the production of refined sodium chloride from brine or the manufacture of portland cement.

3. The operation is essentially one of polymerizing or transformation by physical rather than chemical means. Examples of this are the manufacture of polyvinyl chloride or phenolic resins.

4. The chemical is a byproduct of another process. An example of this is the manufacture of ammonium sulphate, which is largely a byproduct of coke-oven operations.

In general, where annual sales are substantially less than the capital investment, the product is a large-volume chemical intermediate, usually manufactured from a basic raw material, or is derived from a large-volume chemical, which itself has a low ratio of annual sales to investment. Chemicals in this group are often referred to as the "work horses" of the chemical industry. Examples are ammonia, soda ash, and methanol.

Because many of the products in Group II form the base of the American chemical industry, the long-term market is fairly stable and assured. This permits lower rates of plant playout which, in turn, means that lower prices prevail.

Turnover ratio is a good index of the extent to which raw materials are upgraded into a more valuable product. These figures indicate, however, that turnover ratio alone is an uncertain basis upon which to judge the economic worth of a particular chemical process.

Plant Defense for Process Industries

I-Disaster Control

JOHN F. ELICH
As interviewed by Theodore R. Olive

NOTE—John F. Elich, of New York, is a consultant on plant security and a charter member of Civil Defense Research Associates, the new civil defense professional society. As a former agent of the FBI he took an active part in the Bureau's plant security surveys during World War II. More recently, his consulting activities have brought him into intimate contact with a number of industrial concerns, including one of the largest and most diversified chemical companies where he set up the over-all protection system. Since he is acquainted with the detailed problems of process plant security, CHEMICAL ENGINEERING *here discusses the industry's problems with him in the first of two interviews.—*
EDITOR

Editor: Mr. Elich, we want you to tell us some of the things that chemical and other process plant administrators need to know about plant defense and security during these uncertain times: what plants should do to protect themselves against disaster, and how to minimize the possibilities of espionage and sabotage.

J.F.E.: Well, Mr. Editor, it's too long a story for one interview, but it must be told. So far, all too few plants know just what they should do. Too few appreciate the very real dangers in the situation. Only a handful have analyzed the problem and discovered this inescapable fact: their protection is pretty much up to themselves.

Editor: If it's such a long story, where shall we start?

J.F.E.: Maybe I'm wrong, but it seems to me there are two main parts: the part people are calling disaster control, which means preparation for the time when disaster strikes, and the part that deals with minimizing the possibilities of disaster from subversive action—the prevention of espionage and sabotage.

Editor: I'd say they're closely related. Can they be split into two separate discussions?

J.F.E.: Yes they can be. It's true they're related, but a disaster-control program can be set up quite apart from espionage-sabotage control. Furthermore, disaster control is good any time, war or no war. It's as good when a plant lets go from purely natural causes as from enemy bombs or sabotage. It involves no effort that would be wasted if we could be sure tomorrow of 100 years of peace. That's why I think we ought to tackle it first. Incidentally, parts of the same organization also handle espionage-sabotage measures.

Editor: Good! Then take it away on disaster-control. Perhaps we ought to start with the question of who's doing what at present to help plants set up their own disaster-control programs.

J.F.E.: Believe it or not, there is actually not too much being done. In the Federal Government, responsibility for civil security matters is divided. Plants with defense contracts are under the jurisdiction of the Munitions Board—a part of the Department of Defense—with security inspections and advice under the Army Provost Marshal. For other plants and the civilian community, there is the Federal Civil Defense Administration, which was set up by Congress as an arm of the Executive Branch of the government. However, it deals only with general problems and does not consult with individual concerns.

Editor: It's true, isn't it, that civil defense is primarily a state and municipal affair?

J.F.E.: That's right. Most states and many cities have set up civil defense administrations. But, again, these activities usually aren't concerned with individual plants, although some of them have set up plant defense committees and issued plant defense manuals. Incidentally, a basic plant defense manual, "Principles of Plant Protection," was put out about a year ago by the Munitions Board. But I feel it leaves too much to the imagination.

Editor: Where does the FBI come into all this?

J.F.E.: Unfortunately, it doesn't, unless there is evidence of subversion. The Bureau has no funds for surveys of the type it made during the last

The FBI has no funds for surveys, which is too bad. . .

war, which is too bad, because many of the old surveys could easily be extended to the present at very little expense.

Editor: Just what were these surveys?

J.F.E.: Well, during the last war the FBI surveyed thousands of industrial plants from a security standpoint. In each case it prepared a comprehensive report which then went to interested agencies such as the Army and Navy. At the same time Director J. Edgar Hoover wrote to the individual plants, making suggestions and recommendations for their protection.

Editor: What about the FCDA? I've heard it has a Facilities Self-Protection Division. That sounds like plant defense to me.

J.F.E.: Right! It does mean plant defense. This Division has issued a broad administrative guide for "Civil Defense in Industry and Institutions." In time, and probably not too much time, it will start issuing manuals for individual industries. It's also been encouraging the preparation of trade association manuals, for example one by the American Petroleum Institute, which is now in the works.

Editor: So far, so good. What other aids and organizations are there—societies, books and so on?

J.F.E.: There is a good bit of literature developing in magazine articles, individual company manuals, and information put out by the government and organizations such as the Chember of Commerce of the United States. There is one central clearing house for all sorts of civil defense information, the new professional society, Civil Defense Research Associates. Civil Defense officials are members, along with plant security men. New York University has organized the Institute of Disaster Prevention and Control, which is studying all angles and held a very effective three-day symposium last spring.

Editor: That's fine! It sets the stage, but now I want you to give us some specific pointers for process plants—tell us what can be done right now to prepare for disasters that may occur. Let's have a specific program that can readily be adapted to any process plant.

J.F.E.: Alright, here we go. First off, what is the reason for a disaster-control program? Obvious, of course, but its main purposes are to improve morale and to minimize loss of life and property. There are some less obvious purposes, too. Properly carried out, such a program may prevent a small accident from developing into a major disaster. Most fires start small, you know. Another object is to help determine the cause, if a disaster should occur, either to indicate subversion if that was the likely cause, or to help prevent repetitions in the future. Finally, the disaster control authorities of the plant have a duty to the public: to give out suitable reports to press and radio, to notify the families and friends of casualties, and generally to maintain good public relations.

Editor: All necessary purposes. Now, where do we start?

J.F.E.: Quite logically, we have to start with an organization. Then we have to train that organization, and we have to provide it with the necessary physical equipment: tools, communications equipment, shelters, and so on. It's best, incidentally, to start with a skeleton organization of 10 to 15 people, principally the heads of various units. Train them first, and then select the full organization which they in turn will train. Simulated disasters of various sorts are the best training, by all odds, the more realistic the better.

Editor: What about the rest of the plant personnel? Do they get any kind of training?

J.F.E.: They certainly do, but only after the disaster-control organization has reached a high degree of perfection. Procedures for their own safety are what you must teach the whole personnel. They must learn the proper things to do for each type of disaster, or impending disaster. It it's an air-raid warning, then shut-down procedures and a quick but orderly trip to the shelter areas are in order. If it's a fire or explosion from internal causes or sabotage, or an act of nature such as a hurricane or flood, the circumstances will naturally alter what is to be done. Usually it is orderly evacuation of the plant that must be taught for such cases.

Editor: How do you train the overall personnel for sneak raids? After the damage is done, it may be too late to go to the shelters.

J.F.E.: Well the main idea here, aside from shut-down and evacuation procedures, is morale building. Panic is one of the most dangerous things we have to fear. Drill into the personnel that the company is doing everything possible to anticipate trouble, that every employee is an essential and necessary part of the team, and that the disaster-control organization is ready for any emergency. Then you'll have gone a long way toward developing a state of mind that will not panic. That and enough practice in the necessary emergency duties including orderly evacuation.

Editor: You mentioned shut-down procedures in this connection.

J.F.E.: Yes, here's the nub. If a raid is expected, then a properly shut-down plant is less likely to add its own hazardous possibilities to any bomb damage. Or, suppose that part of the plant is already afire from bombing. Naturally, the fire-control team will do the best it can to prevent the spread of the fire. But motors, furnaces still in operation, and combustible materials still in process in those parts not yet affected will add a lot to the danger and decrease the chances of confining the damage. This means that the plant operators in the unaffected parts must be ready for a quick shut-down, possibly after losing power, water and other utilities. It means that designated operating personnel in every part of the plant must be trained to put their own operations quickly into the safest possible condition.

Editor: Can we discuss shut-down a little more specifically?

J.F.E.: Apart from an actual plant, no. The operating men in each plant already have the necessary know-how and probably need only to learn how to proceed under emergency conditions. Furthermore, the details of shut-down will vary all over the map, depending on the type of operation. This is easy to see when you consider the differences between a portland cement plant, for example, and a petroleum refinery.

Editor: True, there isn't much to burn or explode around a cement mill. But a refinery can have some very tough fire problems. Incidentally, what

Plant operators must be ready for a quick shut-down.

about shelters for the shut-down personnel?

J.F.E.: I'm glad you brought that up, for it's very important. If these people are going to stay on the job long enough after an alarm to carry out the shut-down, you must make sure that they can get to shelter in time. This means individual shelters for them, close to or right in the operating area. As a matter of fact, small, low-cost shelters for one to four men close to their work will usually be the best way of taking care of the average process plant. These can be simply constructed—wood and earth is often the best and simplest solution.

Editor: Fine! Now let's get back to the main question, which is the sort of organization a plant needs for disaster control.

J.F.E.: Alright, let's first look at the basic considerations. We can set up a lot of different names for function titles, but regardless of what we call them and what the plant is, the functions will be pretty much the same. What little variations are needed can easily be worked out by the individual plants.

Editor: That's evident. Then what are some of the basic ideas?

J.F.E.: Well, one of the first is that self-sufficiency is fine, but cooperation is better. By that I mean that where there are several plants in a community—especially if their disaster-control problems are rather similar—every plant that gets together with others for mutual emergency aid thereby becomes safer. This is especially helpful to smaller plants that may not be able to have complete disaster control organizations. In the event of a general disaster, such as a heavy fire raid, or an atom bomb attack, mutual aid may not be effective, but otherwise it's quite likely to pay off. If needed, specialists from unaffected plants will be on call to help the others. Regular fire departments and police may be tied up elsewhere so that the industrial teams will be doubly helpful.

Editor: How can such a mutual aid program be worked out?

J.F.E.: I'd say that anywhere from 5 to 20 plants ought to get together, form a cooperative association and learn to know each other and their respective problems. The association should hold regular meetings, pool information on techniques and on available personnel and equipment, and draw up mutual aid plans. Methods of liaison should be worked out and the names and phone numbers of the responsible defense officials in each plant recorded for the benefit of all members. Finally, the association should work for close cooperation with the local civil defense organization.

Editor: That's a mighty good scheme. Now tell us what the other basic ideas are.

J.F.E.: I will. Every disaster-control plan has to make provision for several kinds of hazard, particularly collapse of structures, fire, and the loss of electric power and other utilities, as well as normal communications. Shelters and blast protection, of course, are part of the physical preparation. The plant has to contemplate the possibility of panic, the control of plant personnel during the emergency, and the exclusion of curiosity-seekers and possible saboteurs after the disaster has occurred. Finally, it must prepare to assemble needed information at the earliest possible moment. This would include lists of survivors and casualties, eye witness accounts and other records that may be needed to determine the cause. And, as we've already seen, it must prepare to notify friends and relatives and deal with the public.

Editor: That's all logical. What then?

J.F.E.: Certainly its logical, since any disaster plan is merely the intelligent development of the logic of the particular situation.

Editor: That being the case, what are the functions needed?

J.F.E.: Well, over-all control, of course, followed by emergency communications, direction and evacuation of the general personnel, rescue service, fire-fighting, transportation of disaster control personnel and casualties, guard service, hazard elimination, first aid and medical service. That about does it so far as the immediate period of the emergency is concerned. But then we have the problems of investigation, dealing with the public, and finally of emergency repairs and eventual return of the plant to more or less complete operation.

Editor: That sounds like quite an organization. How do you set it up?

J.F.E.: First, you've got to choose the man to head the entire disaster control organization. Call him the security, or defense, or protection coordinator, or director, or what you will, he's got to be a quick-thinking, cool fellow of good executive ability. In some plants he might be the plant manager or safety director. In others, a professional security man would be your best choice, especially if the plant is a very essential one where sabotage is a distinct possibility.

Editor: Well, as the hub of the whole thing, this man needs special protection, doesn't he?

J.F.E.: Absolutely right! One of the first problems is to set up a control center, strongly reinforced and capable of taking anything less than a direct hit. In addition to regular communications, the center should connect with a P.A. system and should have standby batteries for radio transmission and reception. Although communications comes a little later in the story, we ought to emphasize right here that our mobile transportation units should be provided with two-way radio, and that walkie-talkie units for those teams that must be in immediate communication with the center represent mighty good insurance. That isn't quite all, however, because there is a possibility that the control center itself might be wiped out. That means a deputy for the security coordinator, and auxiliary control centers at two or three other points.

It's merely the development of the logic of the situation.

Editor: Does the security coordinator stay at the control center after the disaster hits?

J.F.E.: No, as soon as possible he needs to set up a new temporary control center—an area command post, to adopt the military term—at the scene of the emergency. His communications are handled by messengers and the two-way mobile radio. Generally the plant manager, maintenance superintendent and safety director will join him at the area post.

Editor: Alright, now we've got the head man and understand his over-all function. Whom else?

J.F.E.: About ten or a dozen key personnel and their deputies, who head functional teams. Let's list them:

1. Communications
2. Fire fighting
3. Rescue service
4. Guard service
5. First aid and medical service
6. Warden service
7. Demolition and repair
8. Transportation
9. Safety, accident prevention
10. Investigation
11. Public relations
12. Military, if present.

Let's list the ten or a dozen key personnel who head the teams. . .

There's no particular significance to the sequence. All these functions are likely to be essential, although some may be combined. The fire brigade, for example, may also perform the rescue function. Safety may not be set up as a separate team, but is likely to be represented in several of the others. In small plants where there may be no regular guards or firemen, the operating personnel can easily be trained to take care of such duties.

Editor: How many members will each of the teams need?

J.F.E.: That can't be stated as a general proposition, because the circumstances of each plant will have to decide. However, once the team heads have learned the rules in their own initial training, they can pretty well estimate what may be needed. It has been suggested that at least six men are needed in the demolition and repair team, with about 14 in the fire brigade and 24 in the medical team per 1,000 employees. As to wardens, the suggested number is 20 per 1,000, with twice as many assistants. However, such figures are averages, while in most process plants the number of employees per unit of plant area is way below the average. Another factor is the often hazardous character of the process materials.

Editor: I can see that. What duties must the various teams perform?

J.F.E.: Alright, let's take them in the order of the list—not in great detail, but hitting the high spots.

Editor: Fair enough. Your first is Communications.

J.F.E.: That includes not only the telephone, but also the emergency communications, radio and messengers, as we've already seen. It also includes the plant alarm system, which means the regular system, possibly amplified with a standby power source. The Communications team will consist of the regular and relief phone operators, and the mail messengers, as well as a number of men to serve as emergency messengers to carry messages at the scene of the disaster, to direct outside aid from the main gate, and to help the first aid team. Operators and mail messengers report to the switchboard at the first alarm. The switchboard takes over control of incoming and outgoing calls, locks or switches out the booth phones to prevent jamming the wires, calls the plant physician and on authorization from the control center makes other necessary outside calls such as to a limited number of plant officials, outside fire departments, hospitals and other medical aid. It requires special authorization for other outgoing calls and accepts incoming calls only from government offices, or persons in command responsibility. The alarm system activating the disaster plan may or may not go through the communications center. As likely as not, it will be touched off in the security coordinator's office.

Editor: So much for communications. What about the fire brigade?

J.F.E.: Responsibilities of the fire brigade vary in different plans, but it is always a good idea to make the fire chief responsible for most of what is done at the scene of the disaster. At least in bigger plants, he will probably be a professional. Therefore, he can make the decision whether or not to fight the fire. He can exert overall control over the rescue squad, the demolition men and the first-aiders. The firemen may sometimes have the responsibility for rescue and demolition, or they may simply fight the fire, but the three functions are inevitably related, which makes the Chief the logical field commander. Naturally, the brigade will report immediately to the scene of the disaster. The Chief's decision will determine whether to attempt to secure outside aid.

Editor: I follow you. What should we expect of the rescue team?

J.F.E.: Their main functions, of course, are to remove casualties from the disaster area, assist unneeded, uninjured personnel to safety, and recover bodies. They must work closely with the firemen and require similar personal protective equipment so that it is logical that the fire brigade do the job. Since the demolition men must work under control of the Chief in lifting fallen beams for rescue, removing hazards and obstructions and sometimes in blasting fire breaks, they can also logically be part of the fire brigade, although they are likely to be drawn from the maintenance trades.

Editor: Where do the guards fit in?

J.F.E.: Their principal job is to control the movement of traffic and personnel—to isolate the scene of the disaster, prevent unauthorized movements within the plant and prevent further sabotage. They will call for outside police help if needed, preserve evidence, prevent unauthorized entry and check personnel out of the plant after the disaster, but only upon authorization.

Editor: How should casualties be handled?

J.F.E.: Well, that's the job of the medical team which includes the first-aiders, and the nursing staff, under direction of the plant physician. The physician, with engineering assistance, is likely to be a good man to pick the shelter locations. When a disaster occurs, the nursing staff takes charge of first aid, treatment and casualty evacuation until the doctor arrives. The first aid crew sets up first aid and ambulance stations near the disaster location, gives first aid to the casualties, and transports them to other points for treatment. The head nurse may make the decision to call for outside medical aid, and may decide when and how patients will be sent to hospitals. Representatives of the medical team will check all personnel at the disaster scene for shock or injury, and provide a written clearance for them to leave the plant, only when it is proper to do so. In this last duty, they will be joined by representatives of the investigation team, to be sure that needed eyewitness information is recorded. Medical team personnel will also be responsible for any radiological monitoring thought to be necessary after an atom bomb attack. The mere knowledge that such monitoring equipment is available is a good morale builder.

Editor: What about wardens? Don't they come into the picture prominently?

J.F.E.: Sometimes, but not necessarily. The main functions of a warden are to conduct people to places of safety, and protect property. This type of specialist was devised primarily for areas of high population density such as residential areas, commercial structures and factories with a great many employees. Of course, some process plants do have a high concentration of employees, in offices, research laboratories and finishing departments, for example. For these the use of warden teams is certainly a good idea. In operating departments, however, the concentration is generally very low, and the operators will have to be trained in shut-down details. The added detail of then seeking shelter doesn't seem to require the use of wardens in such departments.

Editor: We've already spoken of demolition, but you initially mentioned it in connection with repair.

J.F.E.: Yes, I also said that the demolition men would logically be drawn from the maintenance trades. Assuming that the fire brigade itself doesn't handle demolition, the demolition men will still have to work closely with them. This team logically heads up under the maintenance superintendent and consists of trained personnel of all the appropriate trades: pipe fitters, electricians, welders, riggers, and laborers. They must be ready to report at any time to the scene of the disaster, bringing appropriate equipment with them. Their job will be to eliminate hazards and anticipate the probable effect on disaster control that will be caused by further loss of utilities as the difficulty spreads. Finally, after the emergency has ended, as rapidly as possible they make repairs for the resumption of essential services, and finally to get the plant back into running order.

Editor: That last is likely to be a pretty big order.

J.F.E.: It is, and of course in some cases it may be far beyond the capacity of the maintenance department. However, it is often surprising what can be done with a patch-up job if the incentive is great enough.

Editor: Well, we are getting to the bottom of the list. Transportation is the next one.

J.F.E.: I suggest that the transportation unit consist of a group of regularly assigned drivers. It is a good idea to equip them with station wagons from which the seats can be removed to handle stretcher cases. However, evacuating the injured isn't their only job. The unit will be the means for getting auxiliary firemen and first aid crewmen to the scene of the disaster at the earliest possible instant. Having done so, they will ordinarily report back to the area command post for re-assignment. They will carry stretcher cases to the treatment areas and in general will be ready to provide transportation for any necessary movement of personnel or material anywhere within the plant area.

It's often surprising what can be done with a patch-up job.

Editor: That brings us to the safety and accident prevention group. Aren't their activities largely limited to disaster prevention?

J.F.E.: That's true, and the group will ordinarily consist of the regular safety department, members of which will be assigned to work with the disaster control teams in the event that a disaster does occur. Their job, of course, will be to use their special knowledge during the emergency in limiting the effects of the disaster as far as possible.

Editor: Alright, now we come to the investigation unit. It seems to me that its function must be largely that of preventing espionage and sabotage through ferreting out subversive individuals.

J.F.E.: No, that isn't the entire job, by any means. After a disaster, there is always the problem of determining who or what caused it—unless, of course, it was a result of obvious enemy action. This unit should consist of the plant security coordinator, the safety engineer, a representative of the military, if military personnel are stationed at the plant, and others as needed. Probably the others should be drawn from the personnel department. Finally, the plant photographer should be a member of this group. Its jobs will include rushing members to the scene of the disaster to record observed conditions immediately in written records and photographs. It will interview eye witnesses as soon as possible to secure initial impressions before time distorts what the witnesses believe they have seen. It will help in identifying casualties, and will interview both the injured and uninjured before they leave the plant so that it can report at the earliest moment on the causes of the disaster. One of its functions will be to assist any board of inquiry or other outside investigative authorities who may become interested. In the event of evidence of subversion, it will communicate with the local FBI, and with the Security and Intelligence Division of the Department of Defense.

Editor: It's not quite clear to me why it's necessary to include public relations in the disaster control plan.

J.F.E.: There are several good reasons for this. But the main ones hinge on the fact that inevitably there will be an immediate clamor from the press and the family and friends of plant personnel for information. Without a regularly assigned group to take care of these chores, they cannot be handled satisfactorily in the heat of the emergency and it is quite likely that premature and probably erroneous information will be given out. This group will ordinarily consist of a public relations officer, who may be designated by the military if the Defense Department is involved, plus the plant manager, and the security coordinator. Other personnel will probably be needed also, perhaps from the personnel or the public relations department of the company. The team will give out information only on authorization from the plant manager and security coordinator. Any of the top members may originate statements, but this double authorization should always be required. The first duty of the team should be to give out a general statement regarding the occurrence, and as soon as possible thereafter, a detailed statement. A representative of the team can receive the press and radio at the guard office, but will ordinarily exclude these people from the plant for the duration of the emergency. Probably the most difficult job of the team would be to notify friends and relatives of positively identified casualties.

There will be an immediate clamor from the press. . .

Editor: That's a mighty comprehensive organization. Do you recommend that they start training from scratch, or do you think it best to work up a plant disaster control manual in advance?

J.F.E.: Actually, I believe the best method is to work out a rather rough outline in advance and then develop the actual details by experience during the training period. Once that is done, the security coordinator can direct the preparation of a manual which will include not only the detailed duties of every team under several possible emergency conditions, but will also list the names and addresses of team members, and the telephone numbers of key personnel.

Editor: Many thanks, Mr. Elich. You have put real meaning into the idea of disaster control. Next month we'll look to you for just as practical a discussion of espionage-sabotage control in process plants.

Editorial Viewpoints

Phillips' Petrochemical Achievements

On behalf of Chairman Alfred H. White and his committee of the seventy senior chemical engineering educators of the United States, it is our privilege to announce that the Phillips Petroleum Co. is to receive the 1951 Award for Chemical Engineering Achievement. This recognition is accorded for contributions to the commercial development since 1948 of high abrasion carbon black and of cold rubber—timely projects that have proved of great value to American industry and the public it serves.

Presentation of the award will be made at a subscription dinner to be held in the Waldorf-Astoria Hotel in New York on Wednesday, November 28. Members and friends of the chemical engineering profession are invited to share with us and the Committee of Award in honoring a chemical engineering organization that has done much to advance our industry and profession.

Chemical Hybrids

Anyone who went to college more than 20 years ago has difficulty in keeping in touch with many of the newer chemical activities that now represent everyday profit-making businesses in this country. To add to the worry of all of us two new areas, which have been relatively little cultivated heretofore, are now rapidly developing:

One of these is rather obvious, but has had too little attention. It is the area in which inorganic and organic radicals are combined to make a hybrid with properties which neither the straight organic nor the straight inorganic group will provide. Perhaps most conspicuous of such compounds is the silicon-organic group of which the silicones are most prominent. Lately we have been impressed, too, by the burgeoning development of organic phosphorus compounds which suggest many interesting applications in industry. There seems to be no end of the variety of hybrids to be expected. They may even prove to be as important to chemical enterprise as hybrid corn has been for the farmer.

Less noted, perhaps, are the hybrids between aliphatic and aromatic chemicals. Wholly new possibilities of chemical service are appearing as compounds are made in which the benzene ring or other cyclic building block is coupled with compounds largely aliphatic in character. Certainly somebody is going to have to nickname this family of compounds with a distinctive group name unless we are to say that alkyl-aryl is adequate to imply the dual character of their molecular makeup.

Many of these developments have resulted from research to provide certain urgently needed chemical properties without the usual auxiliary and unwanted characteristics associated with the original materials. By combining two types of organics, or the organic with the inorganic, the infinite variety of chemicals seems to become a multiple of infinity.

This should mean that whatever property one wants in a chemical can probably be provided if the research worker is only told what he is supposed to look for. This sort of research may soon become a new and rewarding service to mankind.

Another Big Job for Industry

Currently there is being issued in Washington a series of reports on water pollution which is organized on a basis of Federal and State cooperation for the 15 major river basins of the country. A look at one of the first numbers in this series, that for the Missouri River Basin, shows the staggering magnitude of the job and the important part which industry still has to play.

The Missouri River report deals with an area of half a million square miles, having a population of over eight million. This drainage basin is far from being highly industrialized. But even here the State-Federal Survey has already identified at least 170 industrial plants which are contributing so much to the pollution of rivers that new or enlarged and modernized effluent-treatment plants are needed. Even more facilities for treating municipal sewage are necessary to prevent pollution.

Of the plants thus far studied sufficiently to permit an estimate, the requirements of new capital investment are believed to be in excess of $115 million. Nearly a third of this would be required for approximately 85 industrial plants. Many more industrial projects have been identified as being needed, but so far no estimate has been made of scope or cost of treatment facilities.

One can readily estimate that the 15 major drainage basins will altogether require a couple of billion dollars in effluent-treatment facilities to protect the streams from "unwarranted pollution" as judged by the preliminary estimates of the officials working on these early projects. If even a third of this investment becomes the responsibility of industry, as it may well ultimately be, we can ill afford to ignore the problem even in these busy times of defense manufacture.

Meanwhile every process plant now being built, enlarged or modernized, should be so planned as to permit effluent control and treatment when the means

for prevention of stream pollution have been adequately identified. To disregard these problems now will only make them worse in the future.

Pilot Plants for Farmers

Agriculture may some day adopt the pilot plant system which has long been so familiar in the chemical process industries. One of the tentative recommendations in a program that the U.S. Department of Agriculture has presented for consideration by farmers is that there should be established a series of "pilot research farms."

Each such farm would be representative of an important soil area. "The most advanced knowledge available to researchers in agriculture and in family farm living might be tried out in a whole farm operation. On them, agricultural scientists would discover the potentialities of various combinations of advanced practices. They would be analagous to pilot plants at which research in chemical or mechanical processes is carried beyond the laboratory scale."

One reason for this suggestion is the inability of small-farm operators with limited resources to finance large-scale experimentation on new developments. Cooperative approach to the problem by the U.S.D.A. and the Land Grant colleges is suggested in the program. It was thought that results would be helpful both to farmers and to financial organizations in judging the productive and profit possibilities of proposed improvements in farm methods.

As in other areas of technology the development from the first successful farm experiments to large-scale commercial operations needs skilled planning and guidance. A continuously improving, prosperous, and efficient agriculture is vital to the prosperity of the nation and even to the chemical process industries themselves. Pilot plants may well contribute to it.

One Way to Stifle Research

Congress has obviously not yet fully appreciated the needs of the National Science Foundation. A rather surprising lack of understanding by the House of Representatives was shown by the action to provide only $300,000 for this new agency of government for the current fiscal year instead of $14 million as proposed by the President.

As this is written, the action of the Senate on this matter has not yet been taken. But it is evident that even in the upper chamber of congress there is little enthusiasm for fundamental research and for the development of a scientific student body trained through the scholarships of the new Foundation.

There is some consolation in the fact that perhaps the damage to science itself is not as great just now as it might normally have been. Fewer young men than usual are now available to take advanced training in our colleges under government programs. But it is disappointing to find that our national legislators do not grasp the importance of having a steady stream of trained minds coming out of our colleges for the use of industry, government, and endowed research institutions.

It will be extremely unfortunate if this period of defense preparation should occasion another serious break in the flow of scientific manpower. Congress must somehow be educated to play its part in the support of the National Science Foundation which can and should be an important link in the whole program of scientific training in America.

Light and Truth

Are you telling the truth, the whole truth, and nothing but the truth? We refer, of course, to that field of the chemical business known as "public relations." We all believe in making a profit from our products. We advertise where we think we will find buyers. We run our business in an honest fashion and we deliver what we claim we have for sale. But, what are we doing on our own initiative to keep our friends and neighbors informed as to what goes on in the chemical industry—and why?

Sometimes we may forget that those smells or smokes we take for granted around the plant may conjure up strange visions of alchemists or magicians in the minds of our neighbors. Or they may start scare stories about poisonous pollution of the atmosphere. It's time for all to realize that mystery no longer has a place in the business of chemistry.

When it comes to the use of our products in various foods, we have no secrets to hide. When we make and sell products for human consumption we have no intent to harm or poison our neighbors—and ourselves—with untested products, merely for a fleeting profit. Yet we have done far too little to disprove the unwarranted statements and allegations of some of the zealots who have appeared before the Delaney Committee. Libelous articles in popular magazines that go unchallenged testify to our complacency.

Opportunities to dispel doubts, perhaps even before they are born, may have been ignored by many of us. These opportunities may come again; but without waiting for them, opportunities should be created in every community in which chemical industry is an integral part.

Let's begin by telling our own employees. Move on from there by inviting their families and their friends and neighbors, to see what goes on in chemical plants and laboratories. Let's stick to the facts, but tell all the facts. Perhaps even a little boasting about our industries' contribution to the local and national welfare would be in order. And keep it up: don't have just one "open house" and then relax, thinking the job is done.

Nomograph for Boiling Point Rise

A convenient way to find the boiling point of an aqueous solution of an inorganic salt under given conditions of concentration and total pressure. Eliminates the necessity for constructing Dühring plots.

J. E. MYERS and RICHARD JARZOMBEK

Quite often it is necessary to determine the boiling point of an aqueous solution of an inorganic salt under given conditions of concentration and total pressure.

The nomograph opposite was constructed with the idea that much of boiling point data available in the International Critical Tables and the Smithsonian Tables could be collected and presented graphically in terms of boiling point rise.

Suppose you want to know the boiling point for a 30 percent (wt. percent) K_2CO_3 solution at a total pressure of 28 psia. The x and y coordinates for this solution are given in the table below the nomograph. These are: $x = 4.2$; $y = 5.0$.

How To Use It

First, draw a straight line through the point determined by these coordinates and through the point representing the concentration (30 percent) on the concentration axis. (Broken line on the nomograph.) This line gives an intercept, on the BPR (boiling point rise) axis, of 8.0 deg. F. Next, draw another line through the concentration point and the total pressure point.

The intercept on the correction axis gives a value of 1.0 deg. F. Because the total pressure, in this case, was greater than atmospheric, the correction is positive, and consequently the true boiling point rise is 9.0 deg. F. Since the saturation temperature of pure water at 28 psia. is 246.4 deg. F., the actual boiling point of the solution is 246.4 deg. plus 9.0 deg., or 255.4 deg. F.

Solutions Not Listed in the Table

Suppose you want extensive boiling point data for solutions of a material not listed in the table given with the nomograph. If the particular material is non-volatile and inorganic, the x and y coordinates may easily be found by making two simple experimental determinations.

Determine the boiling points of two aqueous solutions having different percentage solute concentrations (preferably 25 percent and 75 percent) at barometric pressure. The difference between the boiling point of pure water at the barometric pressure and the boiling points of the solutions constitutes the BPR.

Then draw two lines connecting the BPR of each solution with its respective concentration. These lines will intersect at a point having the desired x and y coordinates. The nomograph may then be used, as previously described, over the entire concentration and pressure range listed.

If you need extensive boiling point data on solutions of an inorganic material not listed in the table, you can make experimental determinations of BPR for solute concentrations of 25 percent, 50 percent and 75 percent. Then draw the connecting lines in the manner described above.

Intersection of the lines representing concentrations of 25 percent and 50 percent gives the point to be used for determining boiling point data for solutions having concentrations less than 50 percent. For solutions having concentrations greater than 50 percent, use the intersection point of the nomograph lines for 50 and 75 percent concentrations.

Construction of the Nomograph

Data used in preparing the nomograph were based largely on information found in the "Smithsonian Tables" and in the "International Critical Tables."

BPR (at 1 atm.) plotted on log-log paper against solute concentration, expressed in parts (by weight) of solute per 100 parts of water, gave either a straight line or a curve which could be represented by two straight lines. Therefore parallel logarithmic scales were chosen for the BPR axis and the concentration axis.

The concentration axis was then modified in order to express solute concentration in the more commonly used form, that is, weight percent. The positions of the points between the axes were determined by corresponding values of BPR and concentration for each particular solute.

In an effort to present a means for correcting the change in boiling point rise with change in total pressure, Dühring charts (boiling point of a solution versus saturation temperature of pure water) were quite useful. In effect, the correction was made in accordance with the change of slope of different concentration lines on the various Dühring charts.

For all practical purposes, the correction was independent of the type of solute and could be closely related to concentration and saturation temperature by the following equation:

$$\text{Correction (deg. F.)} = \frac{C\,(t_s - 212)}{15\,(100 - C)}$$

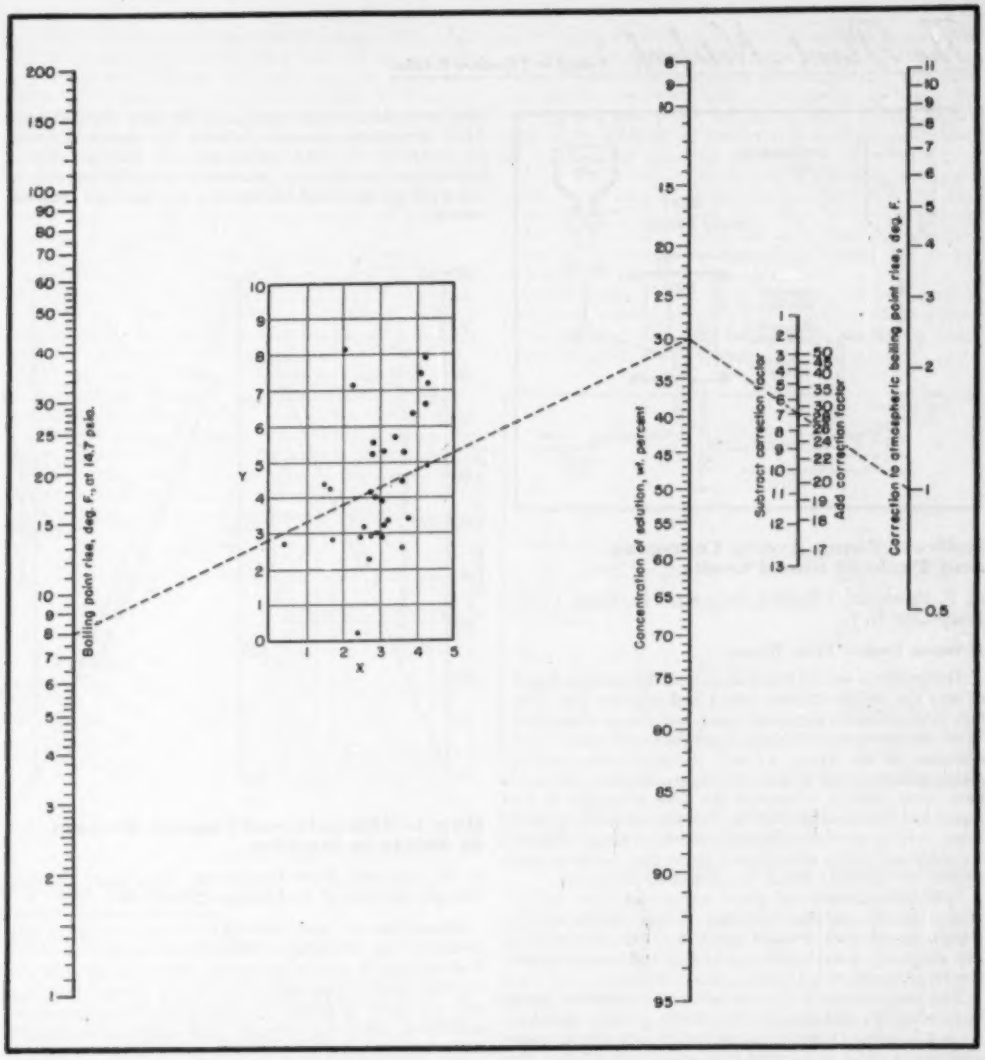
where: C = weight percent solute and t_s = saturation temperature of water at the given pressure.

This equation was then modified to place it in the form $x = kyz$ by expressing the percentage concentration in parts (by weight) of solute per 100 parts water. This permitted the use of three parallel logarithmic axes for the determination of the correction.

The original concentration axis was used as one of the three axes on the nomograph since it is logarithmic with respect to concentration expressed in parts of solute per 100 parts of water.

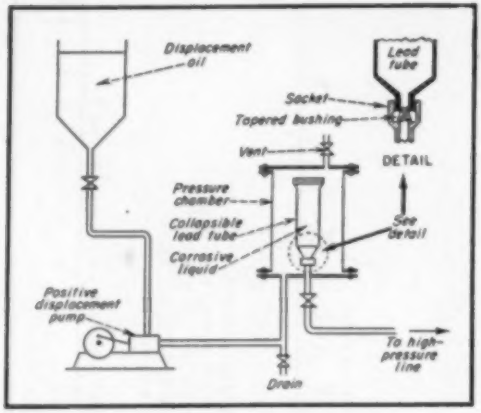
The saturation temperature axis and the correction axis then were drawn in accordance with the modified correction equation. The saturation temperature axis was converted to a saturation pressure axis, thereby making it possible to express the total pressure in psia. As can be seen from the correction equation the correction reverses sign at a saturation temperature of 212 deg. F. (or a total pressure of 14.7 psia). Thus a double scale was used on the total pressure axis.

J. E. Myers *is assistant professor of chemical engineering at Purdue.* Richard Jarzombek *is a chemical engineering student there.*


Boiling point rise, deg. F., at 14.7 psia.
Concentration of solution, wt. percent
Subtract correction factor
Add correction factor
Correction to atmospheric boiling point rise, deg. F.
X
Y

The authors have plotted 32 points for 22 common solutions. You can make your own plots for solutions not listed below.

Solute	wt %	x	y
$BaCl_2 \cdot 2H_2O$	--	2.8	3.0
$CaCl_2$	<50	4.2	6.6
$CaCl_2$	>50	2.3	7.2
$Ca(NO_3)_2 \cdot 2H_2O$	--	2.6	3.2
KOH	--	4.3	7.2
$KC_2H_3O_2$	--	2.8	5.2
KCl	--	3.7	5.3
K_2CO_3	<25	3.6	4.5
K_2CO_3	>25	4.2	5.0
$KClO_3$	--	2.5	2.9
KI	<45	3.1	3.3
KI	>45	3.8	3.4
KNO_3	<50	2.9	3.0
KNO_3	>50	1.7	2.8
LiCl	--	4.2	8.0
$LiCl \cdot 2H_2O$	--	3.1	5.3
$MgCl_2 \cdot 6H_2O$	<65	3.0	3.9
$MgCl_2 \cdot 6H_2O$	>65	1.5	4.4
$MgSO_4 \cdot 7H_2O$	--	2.4	0.2
NaOH	<45	4.1	7.5
NaOH	>45	2.0	8.1
NaCl	--	3.9	6.4
$NaNO_3$	--	2.7	4.2
Na_2HPO_4	--	3.1	2.9
NH_4Cl	<30	3.4	5.7
NH_4Cl	>30	2.8	5.6
NH_4NO_3	<60	2.9	4.0
NH_4NO_3	>60	1.6	4.2
$(NH_4)_2SO_4$	--	3.2	3.4
$SrCl_2 \cdot 6H_2O$	<70	2.7	2.3
$SrCl_2 \cdot 6H_2O$	>70	0.4	2.7
$Sr(NO_3)_2$	--	3.6	2.6



Indirect Pump Averts Corrosion And Packing Gland Leaks

H. F. Reichard, *Chemical Engineer, The Kellex Corp., Jersey City, N. J.*

★ **August Contest Prize Winner**

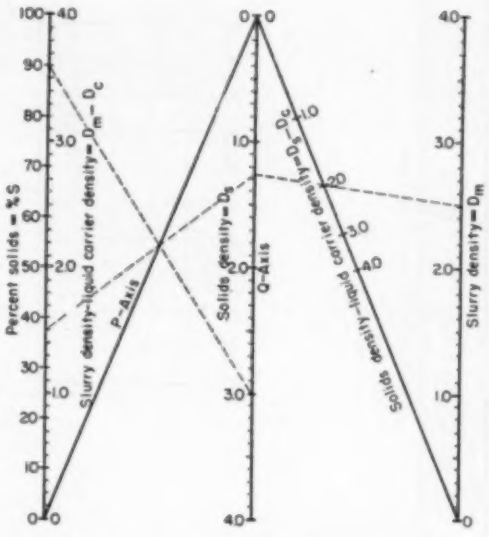
The problem was to inject an extremely corrosive liquid of very low surface tension into a high-pressure line. The flow rate was to be extremely small and closely controlled. With ordinary proportioning pumps the liquid caused rapid corrosion of the valves, as well as considerable packing gland leakage owing to the low surface tension. It would have been difficult to control the flow accurately if the liquid had been forced into the line by gas pressure, since there were variations in the downstream pressure. Finally, we could not find a non-reactive liquid that could be used to feed the corrosive liquid by contact displacement.

Both the corrosion and gland leakage problems yielded readily to the indirect pumping system shown in the sketch. In addition, it could inject the liquid at as small a rate as desired, it was unaffected by high and variable downstream pressures, and its control was excellent.

The fundamental idea is to inclose the corrosive liquid in a collapsible lead tube contained in a pressure chamber. As a non-corrosive pump oil is forced into the pressure chamber it collapses the lead tube and forces out into the line exactly an equivalent amount of the corrosive liquid. For systems where a very low rate of flow is required, replacement of the collapsible tubes is not too frequent.

Construction is largely evident from the sketch. The pressure chamber is fabricated from standard pipe and flanges. The only tricky feature is the outlet connection for the lead tube which must prevent possible collapse of the threaded nozzle of the tube, or leakage around the threads. This is accomplished by the use of a tapered hollow bushing within the socket into which the tube is screwed. Forcing the tube nozzle down over the bushing insures a tight fit. Any suitable positive displacement pump, such as a small proportioning pump, can be used to inject the displacement oil into the pressure chamber.

Collapsible lead tubes can be purchased with the butt end open. The 1-pint size is available at 16-17 cents. To use, the tube is screwed into the pressure chamber, then filled with the corrosive liquid, and the open end crimped. After closing the pressure chamber the system is ready for operation. It is suitable not only for short-run experimental use, but also as a permanent system where only a few parts per thousand are injected into the high pressure stream.


Percent solids = %S
Slurry density–liquid carrier density = $D_m - D_c$
P-Axis
Solids density = D_s
0-Axis
Solids density–liquid carrier density = $D_s - D_c$
Slurry density = D_m

How to Measure and Control Percent Of Solids in Slurries

H. H. Sineath, *State Engineering Experiment Station, Georgia Institute of Technology, Atlanta, Ga.*

Shown here is a rapid method for the determination and control of the percentage of solids in a homogenous slurry. This method is particularly useful where control data are required, since it eliminates the time lag between sampling and laboratory analysis. It is based on the difference in density of the slurry and the liquid carrier and requires little time and the simplest of equipment.

If we consider a slurry with a fraction S by weight of solids and $(1 - S)$ by weight of carrying liquid, the percent solids of the mixture can be developed as follows: Let D_m = weight of 1 cc. of slurry (i.e., density in grams per cc.); D_c = density of carrier liquid; and D_s = density of solids, where all densities are at standard temperature.

Then, from a consideration of the definition of density,

$$D_s = \frac{SD_m}{1 - D_m(1 - S)/D_c} \quad (1)$$

or

$$D_m = \frac{1}{S/D_s + (1 - S)/D_c} \quad (2)$$

Now, solving for S,

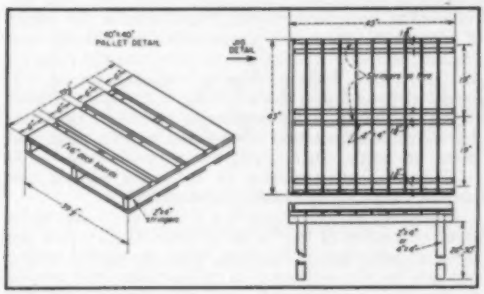
$$S = \frac{D_s(D_m - D_c)}{D_m(D_s - D_c)} \quad (3)$$

Thus, if the density of the solid is known, only simple density measurements of the slurry and the liquid carrier are needed to determine the percentage of solids in a slurry. The accuracy of this determination, is, of course, dependent on the density measurement. However, it has been found that measurement with a hydrometer is satisfactory provided that the solids have a relatively low settling rate. This principle can be applied nomographically, as above, to permit quick determination of the solids content of slurries. The chart is convenient for solids of densities ranging from 0 to 4.

As an example of use of the chart, take $D_s = 3.0$, $D_m = 2.5$ and $D_c = 1.0$. Then $D_s - D_c = 2.0$ and $D_m - D_c = 1.5$. Connect $D_m = 2.5$ through $D_s - D_c = 2.0$ to a point on the Q-axis. From this point connect with $D_m - D_c = 1.5$, intersecting the P-axis. Connect from $D_s = 3.0$ through the P-axis intersection to $S = 90$ percent.

If the density of the carrier liquid is constant Eq. (3) can conveniently be applied to a device for indicating and controlling the percent solids in a slurry. With slight modification standard density control instruments can be used to control the amounts of solids and liquid introduced.

This method should be applicable to non-homogenous systems; however, artificial densities might be required. It should also apply where one component is dissolved in the other.



Wooden Jig Speeds up Pallet Construction

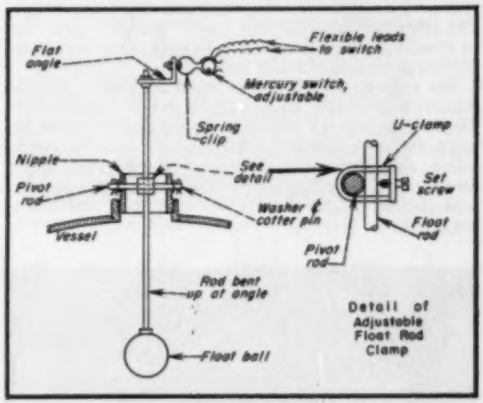
FRANK N. BOSCO, *Engineer, Denver, Colo.*

Efficient plant storage and handling nowadays commonly depends on pallets, which are usually standardized in one or two sizes, such as 40 x 40-in. or 48 x 48-in. Such pallets are also used to a large extent in shipping.

Pallets can easily be constructed from scrap lumber, and at low cost, especially if a pallet jig is used to aid rapid assembly. The sketch above shows a standard 40 x 40-in. pallet. With a simple increase in dimensions it will serve also for the 48 x 48-in. size. The smaller is handy for carrying two pallets side by side on plant trucks. At the right of the pallet detail is a detail of a simply constructed jig which greatly speeds up assembly.

After the 2 x 4-in. stringers and 1 x 6-in. deck boards are cut to length on a bench saw, the jig comes into use. The three stringers are slipped into place in the jig and on them the four deck boards are laid. These are quickly nailed on, after which the half-pallet is turned over on top of the jig and the other deck added.

Combination of the pallet handling system, with a punch-card method of records to tell who, what, where, when, how and why, gives the optimum in efficient warehouse and plant record operation.



Simple Float Switch Prevents Overflow of Weigh Tank

ALFRED B. BABCOCK, JR., *Chemical Engineer, Dobbs Ferry, N. Y.*

When a formaldehyde weight tank occasionally overflowed because the operator failed to turn off the manually operated switch for the storage tank pump, we built a simple and inexpensive automatic cut-off switch to prevent further chemical losses and safety hazards. A commercial automatic levelling device was not warranted since the weight of formaldehyde required in the process varied from time to time (and frequent re-adjustment would be

---

★September Contest Prize Winner

"How to Build a Venturi Proportioner for Accuracy Under Varying Backpressure."

A prize of $50 in cash will be awarded to P. L. Walker, Jr., and R. J. Foresti, Jr., Division of Fuel Technology, Pennsylvania State College, State College, Pa. The entry will appear in the November issue.

$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of *Chemical Engineering* will award $50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook.

The winner each month will be announced in the issue of the next month, e.g., the October winner will be announced in November and his article published in December. Judges will be the editors of *Chemical Engineering*. Non-winning articles submitted for this contest will be published if acceptable at space rates.

HOW TO ENTER CONTEST—Any reader of *Chemical Engineering*, other than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 500 words, but illustrated if possible.

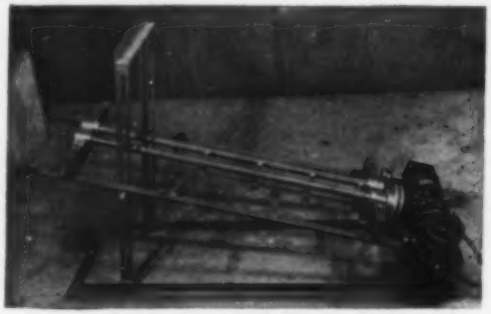
Articles may deal with any sort of plant or production "kink" or short-cut that will be of interest to chemical engineers or others in the process industries. Also, novel means of presenting useful data are acceptable. Address Plant Notebook Editor *Chemical Engineering*, 330 West 42nd St., New York 18, N. Y.

required), and since the overflow trouble was relatively infrequent. The illustrated float switch was made of materials costing only a few dollars, and yet it was completely effective in its function. Furthermore, it was built quickly using the simplest tools.

The sketch is, for the most part, self-explanatory. In the particular application all parts were brass or copper to resist corrosion. The float and rod are standard plumbing items, while the other metal pieces can be found in almost any plant shop. The mercury switch is also a standard item and can be either single- or double-pole, depending on whether a warning indication is desired. The switch itself is very resistant to corrosion, and will easily handle the current loads that can be required by most magnetic motor starters.

The "normally closed" pole of the mercury switch is wired in series with the "stop" button circuit of the magnetic contactor. Then when the switch tilts, the circuit is opened in a manner identical to normal stop button action. The other pole which in this case is "normally open" can be wired in series with a warning light or buzzer to provide additional warning that the tank is full.

The angle of the mercury switch is adjusted so that the mercury will "break" contact at the desired liquid height. The float rod is bent slightly upwards at a point several inches below the pivot, so that the float ball will be on the correct side of the centerline when it rises. The float ball is prevented from dropping below the centerline when the tank empties because the rod will rest against the side of the nipple.



Adjustable Angle Mixer Improves Lab Mixing of Solids

R. S. Young and R. Snaddon, *Diamond Research Laboratory, Johannesburg, South Africa.*

For the majority of samples sent to a chemical laboratory the standard preparation procedure is to pulverize the material to pass a required mesh size and then mix it, or a riffled portion, by rolling on paper or rubber sheeting. Thorough rolling, which is essential to ensure a homogeneous sample, is a tedious procedure. The mechanical device illustrated here, which can mix several samples simultaneously, can be employed not only for the preparation of samples for chemical analysis, but also for mixing finely-divided solids in powder metallurgy and many other fields. It is simple in construction and operation, flexible enough to accommodate a wide variety of quantities and types of powder, and eliminates the personal factor in sample mixing.

The mixer is illustrated in the accompanying photograph. It consists of two ¾-in. steel rods, acting as rollers, on which bottles containing the samples are placed, supported on an adjustable-angle iron frame. One of the rollers is driven by a small variable speed motor and the other roller is an idler. The rollers are enclosed in wide-bore rubber tubing, and run on ball bearings. The fixed roller is run on combined radial and one-direction thrust bearings and the adjustable idler shaft is operated on double-row self-aligning ball bearings. The distance between the rollers can be adjusted from 2½ to 7 in. to hold a wide range of bottle sizes.

The slope of the rollers can be readily altered from the horizontal plane to an angle of approximately 45 deg. by tilting the framework, which is clamped in position by thumb screws. The bottles are kept in position on the inclined rollers by adjustable upright rods having a free-moving roller top. By varying the slope of the bottle and the speed of rotation almost any combination of powdered solids can be satisfactorily mixed.

With the bottle in an inclined position the material rolls around the inside of the bottle and simultaneously moves from the top to the bottom. The time required for complete mixing varies with the quantity of material, particle size, and the difference in specific gravity between constituents of the sample.

The mixing of powdered solids has been discussed in recent years by several investigators,[1, 2] but they have been chiefly concerned with a mathematical analysis of blending problems. Visual observation or particle counts, and not chemical analyses, were employed to determine the extent of mixing. We have used powdered sodium chloride and graphite, and silica and copper, to determine the behavior of this mixer. Sodium chloride was determined volumetrically and copper electrolytically in the mixtures after rolling on this apparatus for varying periods of time, under different speeds and slopes, and various sizes and shapes of bottle. In all cases the materials were −100 +200 mesh, corresponding to the usual particle size of most samples prepared for chemical analysis.

In general, we have found that a slope of 15 deg. and a speed of rotation of the bottle of about 75 rpm. gave the most efficient mixing. The time taken for perfect mixing depends on the difference in particle size and specific gravity of the constituents and, of course, on the size of the sample.

Usually the particle size can be controlled fairly satisfactorily by pulverizing the sample to pass a standard mesh screen. For chemical analytical work samples are usually passed through a 100-mesh, or in some cases a 200-mesh, sieve. As in all mixing operations, the constituents must be thoroughly dried beforehand.

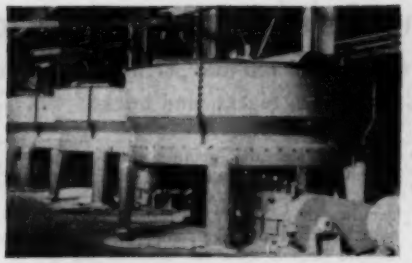
The ordinary type of plastic screw-top, wide-mouth reagent bottle is quite suitable for mixing. A tapering rather than a square shoulder on the bottle is preferred. The length-to-diameter ratio of the bottle should be at least 1.5 to 1. It is also advisable to put the lighter material into the bottle first.

The mixer occupies a space approximately 4 ft. 8 in. long x 19 in. wide x 34 in. high. Since it operates silently and with little vibration it can be placed either on the floor or a bench. It requires no attention during operation and several samples can be mixed at once. It will be found very useful to economize time and labor around a laboratory, and is especially valuable where the rolling of samples is carried out by unskilled workers who require constant supervision.

REFERENCES

1. Brothman, A., Wollan, G. N., and Feldman, S. M., *Chem. Met. Eng.*, **53**, 102-6 (April 1946).
2. Coulson, J. M., and Maitra, N. K., *Ind. Chem.*, **26**, 55-60 (1950).

PRESSURE is used to make catalyst tablets.



EXTRUSION of phosphate in plasticizing pans.

TUMBLING rolls bituminous fines into balls.

SINTERING reclaims ore fines and flue dust.

AGGLOMERATION

Making big ones of little ones is an important step in many processes. Here is a comprehensive roundup of agglomeration techniques and equipment. Development of theory and principles is still largely virgin territory.

CHEMICAL ENGINEERING REPORT—OCTOBER 1951

ALTHOUGH agglomeration is one of the most ancient of the chemical engineering unit operations, its struggle for recognition as such, until very recently, was almost without success. Now that the 1950 edition of the "Chemical Engineers' Handbook" includes a short section on "Size Enlargement," agglomeration can take its rightful place in the unit operations firmament, along with the brighter stars of fluid flow, heat transfer and distillation.

Successful application of agglomeration, indeed, holds the key to the future of the American iron and steel industry. Faced with the prospect of early exhaustion of the rich Mesabi range, the industry is spending millions of dollars studying processes for beneficiation of low grade ores, such as taconite. And the big hurdle in this work is the development of methods for agglomerating the finely divided concentrate so that it can be used for blast furnace charge.

Agglomeration defined

For purposes of this report, agglomeration is defined as any process whereby small particles are gathered into larger, permanent masses in which the original particles can still be identified. This definition excludes flocculation processes, in which the masses are weak and temporary, and fusion or solution processes, in which the particles lose their original identity.

Other terms will be defined where necessary. Terminology is rather loose and sometimes ambiguous, leading to confusion. The term "pelletizing," for example, can refer to operations involving confined pressure, extrusion, or tumbling, and is used in different senses when applied to carbon black or to cracking catalyst. The term "granulation" means one thing to the pharmaceutical man and another to the fertilizer man.

Why agglomeration?

There are many reasons for the inclusion of an agglomeration step in a process flowsheet. Some of these are: To reduce dusting losses; to make solids free-flowing; to provide definite quantity units; to densify light solids; to reduce handling hazards; to provide solids with controlled surface-to-volume ratios; to produce useful structural forms; to prevent segregation of solid reactants; and to provide solids with controlled porosities.

Many Solids Are Compacted by Pressure

Pressures from 1 to 100 tons per sq. in. are used to make tablets, briquettes, blocks, and bricks.

Binder may be required

Powders and small granules can be agglomerated by pressing together while confined within a cavity, with or without a binder. There is no definite rule by which you can predict the pressure required for a given compacting job—it will depend entirely upon the material and the intended use of the product (See Table I). The addition of a binder will usually permit use of lower pressures than when compacting without a binder.

Devices used for agglomerating by compacting, in general order of increasing size of product, are tableting machines, roll-type briquetting machines, and molding presses.

CATALYST pills for petroleum processing come off a rotary tablet press.

TABLETING

Many sizes and shapes

A tableting machine compresses loose material within the cavity of a die by the action of two opposing plungers operating within the cavity with very close radial clearances. Depending upon its size, shape, and use, the product may be called a tablet, compact, pill, pellet, briquette, or preform. Standard punches and dies permit production of tablets and cylinders from ¼ to 31/32 in. in diameter and also compacts with cored, oval, square, and octagonal cross-sections. Punches and dies for any practical shape up to 10 in. in diameter can be made to order.

Upper and lower surfaces of the compacts are usually flat or convex, but the degree of convexity can vary from shallow to spherical. Compacts can be embossed or scored by providing the corresponding reverse impressions on the faces of the punches.

Disks or balls

The maximum thickness of compact depends upon the available depth of fill of the die and the compression ratio of the material. The latter figure is the ratio of the volume of loose powder in the die to the volume of the compressed compact. Although an available depth of fill of 1 in. is sufficient for most tableting work, some machines provide as much as 10 in. depth of fill.

How much pressure?

The desired unit pressure multiplied by the cross-sectional area of the compact determines the pressure required of the machine. With small tablet diameters, light machines can be used. Generally speaking, hydraulic presses, though they produce at a lower rate than mechanical presses, require less pressure. The hydraulic press has a squeezing action which, because of its relative slowness, permits entrapped air to escape from the mass.

Most materials require some prior treatment, other than mixing of ingredients, to insure proper operation of the tableting machines. It is necessary that the material flow easily from the feed hopper into the die and that its bulk density be quite uniform. Two methods are used for preparing the feed—wet granulation and dry granulation or "slugging." Wet granulation involves the pressing of a damp mass through a screen or perforated plate and is discussed elsewhere as a method of extrusion.

Slugging consists simply of precompressing the powdered ingredients into oversize tablets or slugs, then breaking these slugs down into granules of uniform size which are then compressed into finished tablets. You need a rugged press to make the slugs, but if required output isn't too great or the size of the tablets too small you can often use a single machine to do double duty, making slugs and finished tablets in alternate campaigns.

Types of machines

Tableting machines are made in single-punch and rotary types. A rotary machine may have as many as 33 sets of punches and dies.

Single-punch machines are used for low and medium output (up to 130 compacts per min.) and for heavy duties requiring high pressures. The heaviest standard machine can supply a pressure of 300 tons, although for most tableting operations a pressure of 10 tons is sufficient. The capacity of single-punch machines can be increased, within limitations of die diameter, by using multiple-cavity dies and gang punches.

4,000 per min.

Rotary machines are used for high-volume production and light or medium pressures. For small tablets requiring low pressures, production rates as high as 4,000 tablets per min. are obtain-

Table I—Typical Pressures Used in Compacting Operations (Expressed in Tons per Sq. In.)

Clay tile	1 to 2
Many pharmaceutical tablets	2
Phosphate fines briquettes	2
Coal briquettes	2 to 4
Ore briquettes	4 to 7
Dry-pressed clay bricks	5
Iron ore blocks	8 to 10
Phenolic and urea plastic preforms	6 to 10
Melamine plastic preforms	8 to 12
Aspirin tablets	15
Porous metal bearings	20
Life Savers (candy mint)	35
Powdered metal products	40
Catalyst tablets	85
Powdered metal magnets	100
Lighter flints (experimental)	150

Table II—Characteristics of Standard Tableting Machines

	Single-Punch									Rotary			
Tablets per min	33-57	80-120	45-120	45-110	70-90	70-90	10-30	25-80	20-60	6-24	350-450	375-550	1,060	225-675
Maximum dia. of tablet, in.	1/2	1/2	5/8	7/8	1 1/4	2	2	3 1/2	4	4	5/8	1	7/16	1 2/16
Maximum depth of fill, in.	7/16	7/16	11/16	13/16	1 1/4	1 3/4	2 5/8	2	2 5/8	4	11/16	7/8	3/4	1 7/16
Pressure, tons	1 1/2	2	4	7 1/2	12 1/2	15	20	55	75	100	2 1/2	7	2 1/2	15
Power required, hp	1/4	1/2	1/2	1	1 1/2	3	5	7 1/2	5	15	1 1/2	3	2	7 1/2
Height of machine, in.	34	54	52	56	68	67	56	71	54	103	64	66	66	74
Floor space, in.	18x21	20x27	32x30	27x34	40x48	37x57	51x60	30x65	28x65	65x93	28x43	44x34	32x30	52x74
Net weight, lb	175	375	400	785	1,375	2,450	7,000	5,300	5,800	14,500	1,050	2,075	2,175	5,730
Approximate cost	$ 350	900	1,100	1,800	2,100	3,800	7,800	8,800	12,000	15,000	1,900	3,100	4,000	8,000

able. As tablet size and required pressure increases, machine output decreases. Even at that, large rotary machines can make 40 to 50 compacts per min. in diameters of 5 to 6 in. Variable-speed drives enable rotary machines to operate at rates suiting the material.

An important advantage of rotary machines is that they will handle fine powders and materials which will not feed satisfactorily on single-punch machines. This feature makes them especially desirable for slugging.

Cost data

Characteristics and approximate prices of some typical tableting machines are listed in Table II; these data can be used in preliminary engineering evaluations. Special dies for powder metallurgy range in cost from $150 to several thousand dollars, averaging approximately $400 per set. Estimation of operating labor is difficult, depending entirely upon the particular conditions. In some cases, such as tableting of aspirin, candy mints, and catalysts, one man can operate as many as 20 presses. Where more expensive materials are being tableted, however, an operator may be required for every two or three machines.

Binders in common use include silicates, clays, dextrin, gelatin, starch, resins, water, alcohol, and sulphite waste liquor. Where the active ingredients are only a fraction of the final weight of tablet, diluents such as lactose, corn starch, and precipitated $CaCO_3$ are used. Lubricants are added to the mix, when necessary, to facilitate ejection of the finished tablet from the die after compression. Typical lubricants are talc, graphite, soap, magnesium stearate, white mineral oil, boric acid, and sodium benzoate.

Tableted products are familiar to most of the civilized world in such forms as aspirin tablets and Life Savers. Many others, however, although less familiar to the general public, are of greater interest to chemical engineers. Chief among these are tableted catalysts or catalyst supports.

Chemical tablets

Among the tableted products of the chemical industry are calcium cyanide, sodium chloride, and calcium hypochlorite. Hypochlorite tablets, ¾ in. dia. by ¼ in. thick and weighing about 1/6 oz., are used with a special feeder to obtain a solution of controlled strength in small-scale water purification jobs.

Triturate machines are used for low-pressure molding of tablets. Moist material is fed onto a mold plate where a small rotor presses the material into the mold cavities. The tablets formed in the cavities are discharged onto a conveyor by means of another plate provided with fingers which punch through the mold cavities. The ejected tablets are either air or oven dried.

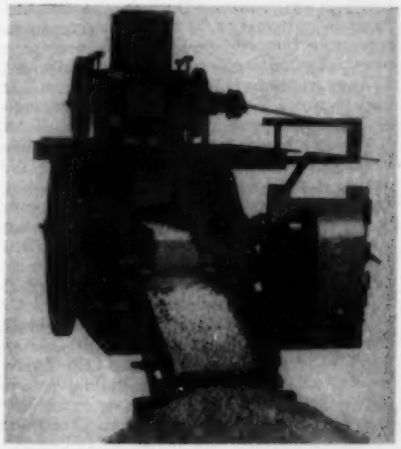
Many chemical engineers are familiar with the products of the Tempil Corp. for determining temperatures of hot atmospheres or surfaces. Tempil pellets and Tempilstiks are both made in tableting presses. The pellets are 7/16 in. dia. by ¼ in. thick and the sticks are ¼ in. dia. by 3 in. long.

Used for plastics.

Plastic preforms are partially compressed masses of molding compound from which finished plastic parts are molded. They are useful for more accurate and less wasteful loading of molds; they also speed up plunger molding because they heat more rapidly with dielectric heating. These preforms, made by tableting techniques, are true agglomerates in that the original particles retain their identity.

... and metals

Powder metallurgy techniques are used for the production of porous bearings, electric contacts, cemented carbide tools, cams, gears, and many small machine parts. Metal powders, including small percentages of lubricant, are compressed into the desired shapes in tableting machines and are then sintered in a furnace in a non-oxidizing atmosphere to develop metallic properties.



GLAUBER'S SALT is briquetted on roll-type press. Note upper densifying roll.

BRIQUETTING

Roll-type briquetting machines compress loose material within the cavities formed by bringing together two rolls provided with appropriately shaped pockets. Products are commonly referred to as briquettes, although large compacts made with tableting machines, and even some extruded products, are sometimes called briquettes, and small compacts made with briquetting machines can just as easily be called tablets, pills, pellets, etc.

Briquette shapes

The most common briquette shape resembles a stuffed pillow. Other common shapes are

double pyramid, almond, egg, and rod. Appearance sometimes dictates the shape, although for industrial uses the amount of voids in a bed may be the deciding factor. Briquettes may range in weight from several grams to a pound or more.

Briquetting machines, generally speaking, are not as versatile as tableting machines. They are eminently suited, however, for economical production on tonnage scales. The size of briquette and the nature of the material will fix the roll diameter, usually between 10 and 36 in. A standard roll width between 4 and 27 in. is then selected which will give the desired capacity at a speed between 5 and 15 rpm. The number of pockets on the circumference ranges from 30 to 72, with up to 16 rows across the face.

How much pressure? The best method of predicting the pressures required for briquetting is from data obtained on a hydraulic press. Materials which can be compacted at 8 to 10 tons per sq. in. can generally be briquetted successfully. The pressure actually developed on a briquette by a roll-type press is difficult to calculate. It depends upon the area of the roll actually doing work on the material and the distribution of pressure over this area. These in turn depend on the nature of the material and the shape of the briquette.

The physical and chemical properties of the material are of primary importance if they are to be briquetted without a binder. Unfortunately, however, data on this subject are limited to general information. Most organic compounds apparently briquette readily at moderate pressures. Typical ionic salts such as NaCl and KCl can be briquetted but require comparatively high pressures. Tightly bonded compounds such as SiO_2 cannot be briquetted by pressure alone.

Importance of binder Where a binder is necessary, no other single factor can be as important in determining the quality of the briquette. Hundreds of binding agents have been tested; comparatively few have proved successful. The three best are petroleum asphalt, coal tar pitch, and starch in combination with either of the first two. Portland cement, sodium silicate, molasses, and sulphite liquor can also be used as binders.

The proportion of binder used is an important consideration. With coal, too much binder will result in a smoky briquette; too little binder results in disintegration during loading or handling. The percentage of binder varies with the material and is a function of density, porosity, surface smoothness, size of grains, and characteristics of the binder itself.

From 5½ to 6½ percent of petroleum asphalt is required to produce good bituminous coal briquettes. Anthracite needs slightly less. The percentage is higher with lignite or lignite char.

Cost data Prices for briquette presses range from about $4,000 to $35,000. A $4,000 laboratory press has a roll diameter of 12 in. and a face width of 4 in. An $18,000 production machine with 20¼-in. dia. by 9¼-in. wide rolls, powered by a 40 or 50-hp. motor, can turn out 2 tons per hr. of 5-g. KCl briquettes or 4 tons per hr. of 1-oz. briquettes. A $25,000 machine with a roll diameter of 30 in. and a face width of 12 in. will have a capacity of 60 tons per hr. on iron ore and 25 tons per hr. on coal.

A briquette press will run without attention as long as a uniform material is fed to the press. It is customary, however, to station an operator at the machine. In the case of small installations, the operator frequently packages the product or performs other duties. **Labor required**

The mechanical work of briquetting causes a temperature rise in the material of as much as 40 deg. F. Rolls are commonly cooled when briquetting materials with low melting points or when an asphalt binder is used.

Where a binder is required, all non-fibrous materials should be ground quite fine. If large particles exist in the mixture, they will tend to break up during compression in the mold, weakening the briquette structure considerably. Most materials apparently briquette best if sizes of particles cover a range of about 10 to 100 mesh.

Mixers for blending binder and solids are usually a special form of pug mill, although standard pug mills and mullers are sometimes used. Mixers can be provided integral with the briquetting machines, which is especially desirable if the binder is to be used at an elevated temperature. When using hot binders, the briquettes must be cooled adequately before subjecting them to loading or storage.

Assists in reactions of solids Chemical engineers will be interested in briquetting as applied to the process industries. At least two applications involve the briquetting of two or more solids in an intimate mixture in order to prevent segregation during subsequent processing. In some glass plants the ingredients are thoroughly mixed and briquetted before charging to the furnace. And in the Pidgeon process for making magnesium, dolomite and ferrosilicon are briquetted together for charging into the retorts. In the manufacture of calcium carbide, lime and coke fines seriously interfere with furnace operation. They are briquetted and used satisfactorily as furnace charge, thus recovering valuable materials which would otherwise be lost.

TVA experience TVA has experimented with briquetting of phosphate fines. The experimental machine was a small roll-type press with a rated capacity of 6,600 lb. per hr. of bituminous coal at a roll speed of 12 rpm. when producing 2 by 2 by 1-in. pillows. TVA found that this machine could produce 5 tons per hr. of phosphate briquettes at the same roll speed. The rolls were of mild cast steel, 12 5/16 in. O.D. by 8 in. wide, each provided with 80 pockets in four circular rows. The machine was driven by a 5-hp. motor.

Several alterations to the briquetting press were found to be necessary. Serious deformation of the edges of the pockets occurred, and the briquetted material would not discharge. These difficulties were remedied by reshaping the molds and by increasing their hardness from 170 to 495 Brinell by a carburizing treatment. To aid further in dislodging the briquettes from the molds, particularly when the feed material was too moist, air jets were installed on each side of the machine so that air could be blown tangentially on each row of pockets. Increasing the clearance between the rolls to 1/16 in. also helped.

Optimum moisture content A moisture content of 13 to 15 percent of the charge was found to be optimum. When the charge was too dry, the briquettes were not

bonded properly; when too wet, the briquettes would not discharge from the molds. Freshly made briquettes, or those stored without loss of moisture, were stronger than those which had been allowed to air dry in 200-lb. piles for 24 hr. or had been oven-dried. Strongest briquettes were obtained when clayey matrix, rather than sandy matrix, was used as the binder.

Chemical briquettes

Among chemical products agglomerated with briquetting machines are ferrous sulphate, barium chromate, sulphur black, silica gel, sodium chloride, sodium sulphate, soda ash, and maleic anhydride. Soda ash briquettes are approximately 1¼ by 1 by ¾ in. in a walnut shape, made with an organic binder. Used to reduce the sulphur content of pig iron, they are thrown into the molten iron at the runner or in the ladle. The briquettes provide a convenient, dustless form. Maleic anhydride briquettes, in a pillow shape about 1¼ by 1 by ½ in., provide safety and convenience when handling this toxic and corrosive chemical.

An operation somewhat similar to briquetting is involved in the preparation of preformed feeds for continuous conveyor dryers. The wet mass, usually a filter cake, is pressed into the grooved surface of an internally heated drum, where it is partially dried and discharged in the form of sticks. Discharge of material is aided by an assembly of stationary fingers projecting into the circumferential grooves like doctor blades. This method of preforming is used with pastes that are too wet to be granulated or extruded.

The sticks are usually about 5/16 in. square and 1½ to 2 in. long. Drum diameter is either 20 in. or 36 in. and width is either 2 ft. or 8 ft. Speed of rotation varies from ¼ to 3 rpm. Depending upon the characteristics of the material handled, these drums will preform from 100 to 3,000 lb. per hr. of solids.

OTHER PRESSING OPERATIONS

In addition to tableting and briquetting machines, which are well adapted to production of large quantities of small and medium-sized products, other types of molding presses are used for large or special products. Some of these presses have been especially designed for specific duties.

A good example is the type of machine used for dry-pressing tile and brick. These presses use two opposing plungers operating within a mold. Best results are obtained when action of the plungers permits escape of entrapped air from the material being compacted. After the mold is filled, the upper plunger is lowered into the mold, then the lower plunger rises alone, and, finally, both plungers push against each other. Provision can be made for evacuating the mold to get a better quality brick.

Brick presses

A typical dry press for brick manufacture, costing about $30,000 and using 30 to 40 hp., delivers a maximum of 750 tons pressure and can accommodate a mold as large as 14 by 24 in. The actual mold area used depends upon the unit pressure required to make a good brick. If 5 tons per sq. in. is required, a 750-ton press can handle only 150 sq. in. of mold area. The mold, however, can be provided with multiple cavities so that several pieces can be made with each stroke. With four to six bricks pressed per stroke, capacity of the press is 2,000 to 3,000 bricks per hr.

Tile presses

Typical tile presses deliver from 50 to 100 tons pressure, powered with motors in the range of 2 to 15 hp. Capacity per stroke, depending upon the required unit pressure, may vary from one to six tiles up to 6 by 6 in.

Dry presses handle materials which are relatively low in water content, compared with other manufacturing methods used in the ceramic industry. The charge contains about 4 to 5 percent moisture, which is usually the "as is" condition of the material. Dry-pressed products can be handled with only a minimum of care and do not require drying before firing.

Operation of brick and tile presses on a volume basis is largely automatic. Labor is required for handling materials to and from the pressing operation, but little actual attention time is required. A single unskilled attendant can supervise up to four tile presses.

Although extrusion processes predominate in the manufacture of building brick, dry presses are widely used to make silica, magnesia, chrome, and carbon refractories. They are also used to some extent for agglomerating ores preparatory to smelting or reduction. Much lighter pressures are used with ores in order to leave maximum porosity.

Iron ore blocks

Agglomeration of iron ore by molding presses was common prior to 1920. Several plants were making bricks of various sizes, such as 6 by 6 by 3 in. or 8 by 4 by 2½ in., from fine ore and/or flue dust. Moisture in the feed was adjusted to a suitable value, around 10 percent, and the green bricks, pressed at 5 to 10 tons per sq. in., were sufficiently strong to withstand handling through the kiln. The burned bricks seemed to be an ideal blast furnace feed. Because of the high cost of this operation, however, it was displaced by sintering processes.

The picture may now be reversing itself. According to a recent announcement, an iron ore agglomeration plant has begun the manufacture of 25-lb. blocks, made by mixing ore dust with salt, cement, chemical binder, and water, and pressing in a cylindrical mold. Present production of the $150,000 plant is reported to be 150 tons per shift.

Packaged fuel cubes

In certain parts of the country coal fines are pressed into bricks or cubes of from 3 to 12 lb. each, wrapped in paper, and sold as "packaged fuel." Although the bonding of packaged fuel cubes is much weaker than that of briquettes, they will withstand the required handling before ignition in the fuel bed.

Inasmuch as they are not usually exposed to the elements, most fuel cubes are made with a starch binder, amounting to about 10 to 20 lb. of starch per ton of coal. About 5 to 10 percent water is usually required. A typical cubing machine exerts up to 50 tons pressure and turns out six cubes at a time. The cubes are air-dried after wrapping.

Investment in packaged fuel plants (prewar basis) averages about $5,000 per hourly ton of capacity in the range of 2 to 12 tons per hr. Packaging and handling labor runs about 1 to 1½ man-hr. per ton.

Plastic Masses Can Be Extruded

Commonly used to make brick and tile, extrusion is finding its place in the chemical process industries.

Extrusion of a plastic mass through a suitable opening requires a pressure which depends upon the flow properties of the mass. Although extrusion of metals and polymers requires pressures as high as 150,000 psi., agglomerates normally are extruded at much lower pressures. In the stiff-mud process for making brick, only 100 to 250 psi. is needed. Clay catalysts and absorbents are extruded at 1,800 to 3,000 psi. Pellet extruders for animal feeds, developing pressures of 8,000 to 10,000 psi., are in the range of tableting and briquetting pressures.

Extrusion, strictly speaking, is merely a means for putting into smaller pieces or a more useful shape a mass of material which has already been agglomerated by plasticizing with a suitable liquid. Although preparation of the paste or dough is the actual agglomerating step, it is usually done by conventional mixing operations.

Clay vs. sand

Some materials can be easily plasticized, others cannot. Every child knows that mud pies made from a clayey material are better than those made from a sandy material. Generally speaking, colloidal particles can be more easily agglomerated than crystalline particles. To agglomerate crystals at the moderate pressures used in extrusion, therefore, you usually need a binder, such as clay or silicates.

DAMP MASSES are pressed through granulator screen by oscillating or rotating bars.

PRESSING THROUGH SCREENS AND PLATES

Wet granulation

Where the strength and dimensions of the product are secondary, the agglomerated mass can be pressed through a screen or perforated plate. The wet granulation process used to prepare some materials for tableting involves this type of operation.

For laboratory work, the mass can be simply pushed through a screen by hand. For larger quantities a special machine, known as a granulator, is used. It consists of a set of bars arranged in cylindrical form which oscillate or rotate over a screen or perforated plate of suitable mesh. Capacity of granulators is limited by the mesh size. With 4 and 6-mesh screens, capacity may be as much as 1,000 to 2,000 lb. per hr.

The action of a granulator depends upon the plasticity of the feed. Where the feed contains greater than 10 to 12 percent moisture, the granulator performs essentially an extrusion operation. When used for breaking up slugs made on tableting machines in the dry granulation process, the granulator functions more in the nature of a size reduction and classification device. Although granulators are normally used in conjunction with tableting, the dry granules sometimes constitute the finished product. Familiar examples are the common effervescent salts used for headache remedies.

Extrusion vs. size reduction

Standard granulators are 48 to 54 in. high and occupy a floor space of about 12 to 15 sq. ft. Driven by motors in the range of ¾ to 3 hp., they cost about $1,200 to $1,500. Corrosion-resistant contact parts can be furnished.

Large scale operations similar to wet granulation are done in plasticizing pans. In these pans the moist material is ground, rubbed, and plasticized by the mulling action of rolls. Plows and scrapers keep the material under the rolls. As the material becomes plastic, it is extruded through the perforated bottom of the pan.

Plasticizing pans

Plasticizing pans are used in the phosphate fertilizer industry for agglomerating fines from the mining of phosphate rock. The fines are mixed with water and extruded through 500 1-in. dia. holes in the bottom of a 12-ft. dia. pan. Such a machine, requiring 150 hp. and costing around $45,000, can agglomerate 30 tons per hr. on a continuous basis.

Feed for continuous conveyor dryers is sometimes preformed by a device which consists of a pair of 8-in. dia. rolls oscillating back and forth across a curved perforated plate at a frequency of 5 to 16 cycles per min. The feed is introduced between the rolls. Inasmuch as the rolls are supported at the pivot point, the material is pressed through the plate by the bite of the rolls and not by their weight. Extrusions are about ¾ in. in diameter and vary from about 1 in. to 3 in. in length.

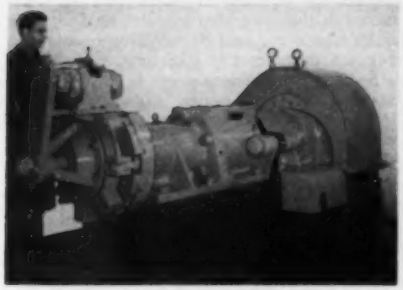
Extruded carbon black

A similar device is sometimes used to pelletize carbon black. A paste of black and water is pressed through a cylindrical plate by four horizontal rollers. The plate, approximately 20 to 24 in. dia. by ¾ in. thick, is drilled with about 3,200 ¼-in. holes. The extruded strings break of their own weight, drop into a dryer, and at the dryer outlet break up further into small cylinders and granules, the cylinders being approximately ¼ in. dia. by ¼ in. long.

EXTRUSION THROUGH DIES

For stiff masses

Extrusion through dies has proved to be an economical method for molding agglomerates on a large scale where relatively stiff masses and simple geometrical shapes are involved. Manufacture of building brick, sewer pipe, flat and hollow tile, and other clay products probably constitutes the largest use of extrusion machinery. Although



CATALYST is extruded like spaghetti and cut into pellets by whirling knives.

many special catalysts are made on tableting machines, the large volume of clay catalyst used in the petroleum industry is extruded.

The die may be a simple opening for as simple shape, like brick or flat tile, or it may be of complex design for shapes like corrugated roofing tile or hollow wall tile. For making catalyst pellets the die consists of a plate perforated with a number of small holes. A typical die for extrusion of clay catalyst might be 7 in. O.D., 1¼ in. thick, with 300 ⅛-in. holes.

In the usual horizontal extruder, pressure is developed by a screw working within a cylindrical barrel. The plasticized mix goes in at one end of the screw and the product is extruded continuously from the die at the other end. The screw or auger is usually tapered, being larger at the feed than at the discharge end. Where a high-strength product is desired, the mass is de-aired by passing it through a vacuum chamber before extrusion. The entrance to the vacuum chamber is appropriately sealed with a feed screw.

Moisture vs. pressure Moisture content for clay extrusion is on the order of 20 percent, although vacuum de-airing machines can handle rather wet masses. The pressure required at the die varies with the moisture content. A manufacturer of heavy-duty clay catalyst pelletizers reports that a decrease of 1 percent moisture will double the required pressure.

In the TVA work on phosphate fines, moisture content was found to be critical at around 17 to 18 percent. When the moisture content was too high, the mixture extruded easily but produced soft pellets which were very difficult to handle. When the feed was only slightly on the dry side, the pellets were firm and did not stick to each other, but the machine was overloaded and stalled frequently.

Sizes and costs Extrusion machines for plant-scale operations run from 6 to 20 in. auger diameter, although one for test work has an auger only 3 in. in diameter. Production capacity and power required depend upon the plasticity of the material.

Table III—Sizes of Pellet Extruders

Nominal Capacity, Lb. Per Hr.	Motor Hp.	Weight, Lb.
100 to 300	5	1,800
250 to 750	15	2,800
400 to 1,200	20	4,000
750 to 2,000	30	5,500
1,500 to 4,500	60	7,000
3,000 to 9,000	125	8,500

A 6-in. machine can handle 1 to 1½ tons per hr. of pottery clay with a power requirement of 7½ to 10 hp. A 12-in. machine might handle 6 to 12 tons per hr. and require 50 to 60 hp. Typical costs range from about $4,000 for a 3-in. machine to $18,000 for an 18-in. machine.

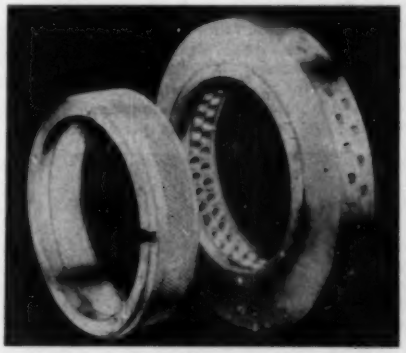
Heavy-duty machines For many applications outside the ceramics industry, however, heavier and more rugged machines are necessary, as witness TVA's experience with overloading and stalling. A typical heavy-duty 6-in. clay pelletizer handling 1,000 to 4,000 lb. per hr. requires as much as 100 hp. and costs about $25,000 (see Table III).

In the production of brick or tile by extrusion, the extruded clay bar passes along a short belt conveyor onto a cutting table on which a frame with a number of wires automatically cuts the bar into appropriate lengths. Clay catalyst pellets are made with a machine provided with a perforated die and a set of rotating knives which cut the small-diameter extrusions into short lengths. The knives may rotate at some speed variable between 80 to 250 rpm., according to the rate of extrusion and desired length of pellet.

Rotary pellet mills Another type of extrusion device designed specifically for making pellets employs a rotating ring-shaped die provided with from 300 to 3,800 holes. A pair of horizontal corrugated rollers operating inside the ring press the solids through the die as it rotates at a speed of 200 to 300 rpm. The rollers are not driven but revolve by friction. Pressure exerted on the material being extruded is estimated at 8,000 to 10,000 psi.

Stationary Ni-Hard knives riding outside the die at about ⅛ to ¼ in. clearance cut off the pellets as they are extruded through the holes. The clearance is adjustable in order to control pellet length. Standard dies are available for producing pellets from ⅛ to ¾ in. dia. The larger the diameter of the extruded pellet, the thicker the die must be. Die thicknesses range from 1 in. to 4 in.

The charge is fed into the extrusion chamber inside the die by gravity from a conditioner-feeder which consists essentially of a horizontal paddle mixer and screw conveyor. Injection of live steam adjusts the temperature and moisture content as desired. The feed is usually heated to 175 to 180 deg. F.



CYLINDRICAL DIES for rotary pellet mills. These two make different sized pellets.

Sizes and costs

These machines are made in two standard models. Dies for the smaller one are 12 in. I.D. by 3½ in. wide; the larger dies are 16 in. I.D. by 5 in. wide. The smaller machine, powered with a 25-hp. motor, has a capacity of 4,000 to 5,000 lb. per hr. of ⅛-in. dia. animal feed pellets. The larger one can be powered with 50 to 75 hp.; at 75 hp. it will produce 20,000 to 25,000 lb. per hr. of pellets. Typical costs for bare machines are $2,600 to $4,800. These figures do not include motors, conveyors, coolers, dryers, and other auxiliaries which are part of the installation. The machines stand about 6 ft. high and occupy 30 to 50 sq. ft. of floor space.

Although this machine was developed originally for pelleting animal feeds formulated from various grain and mineral elements such as bran, oats, distillers grains and soybean meal, it has been adapted for many other products. Units are being used for pelleting sewage sludge, urea crystals, clay and fullers earth.

Other applications

With the exception of clay products, agglomeration by extrusion seems to be used in the process industries to a lesser extent than other agglomeration methods. Somewhat related to clay products is the extrusion of carbon and graphite products, principally electrodes.

Another application of extrusion is in a new process for recovery of waste iron sulphate. Although the main step involves sintering, the sinter feed is prepared by extruding a paste into ¼-in. dia. cylinders ¼ to ½ in. long.

Sodium pentachlorophenate is extruded in a machine of special design to give a dust-free, readily soluble briquette, measuring approximately 1¾ in. diameter by ⅞ in. thick, weighing about 1 oz. This form makes it easy to add in small doses when used to combat slime in cooling water systems.

Although clay masses lend themselves easily to extrusion, such is not the case with the more refractory oxides, which are usually agglomerated by other means. A recently developed wear-resistant ball mill grinding medium, made of purified alumina, however, is said to be made by a special extrusion technique. It is made in the form of cylinders ⅜-in. dia. by ⅜-in. long and 1¼-in. dia. by 1¼-in. long.

Spheres via extrusion

Pills or marbles are sometimes made by rolling extruded pellets into balls. Special machines are built for the pharmaceutical industry which extrude the pellets and roll them between belts. Refractory pebbles of kaolin, mullite, and 85 percent alumina for use in pebble heaters are made by extruding a plastic mix and forming into ⅞-in. and ½-in. spheres.

Spheres Are Formed by Tumbling

Although still largely an empirical art, tumbling offers an economical approach to agglomeration.

In contrast with other methods of agglomeration, the formation of balls or pellets by tumbling or agitation makes use of neither heat nor pressure. Pelletizing, the term most commonly applied to this operation, occurs in an agitated mass of solids when the attractive forces, such as cohesion and surface tension, acting between the particles are sufficient to withstand the mechanical treatment to which the agglomerates are subjected. The strength of these forces depends upon such variables as particle size, moisture content, and previous history.

Case for pilot plant

Pelletizing is at present largely an empirical art. Design of plant-scale units from bench tests is impossible with the present state of knowledge, and pilot plant tests are essential. Because of variations in pelletizing practice from one plant to another, generalizations are difficult and impractical. The subject can best be discussed in connection with specific industries.

CARBON BLACK is pelletized in rotating drums. Pellets may be as small as 250 microns.

PELLETIZING OF CARBON BLACK

Carbon black's lightness and fluffiness make for costly shipping and storage and messy handling. Conversion into pellets less than ¼-in. in diameter increases the bulk density tremendously, cuts down on shipping and storage costs by permitting bulk handling, and reduces the amount of dust at points of use.

Wet vs. dry

Pellets may be formed by either dry or wet processes. Pellets made by wet processes are much stronger, harder, and shinier than those made by dry processes. On the other hand, wet processes are somewhat more difficult to operate and more expensive to install. One reason for the additional cost is that the drums must be made of stainless steel.

In one dry process the carbon black is turbulently agitated in a vertical cylindrical vessel by several sets of spirals, mounted concentrically. Alternate spirals rotate on the vertical axis in opposing directions. Between pairs of spirals are a number of vertical stationary baffle posts. A variation of this design provides for rotation of the spirals all in the same direction at about 37 rpm. and rotation of the baffles in the opposite direction at about 1¼ rpm.

Seeding helps

A batch of black is charged to the vessel and agitated until it is converted into spherical pellets. To speed up the process, the batch is seeded with 60 to 100-mesh pellets from a previous operation. Pelletizing occurs within an hour.

Capacity of a 4-ft. dia. by 6-ft. high unit is

5 tons per 24-hr. day. This machine is provided with a 15-hp. motor to overcome starting load, but running load is only about 7½ hp. One operator can take care of several such units.

Pellets from pigments

A small vertical test model is available; the cylinder is 8 in. dia. by 14 in. high. A 1-hp. drive can be varied from 80 to 320 rpm. The required speed of rotation of the spirals is different for different materials. This type of machine is applicable to other finely divided solids and has successfully pelletized various pigments and dyes.

In another dry process the black is fed continuously into a horizontal drum which is divided into a series of compartments by transverse doughnut baffles. Freely rolling rollers which aid in the compacting of the black are placed in some of the compartments. The drum rotates at about 6 to 7 rpm.

Drums in series

Two rotating drums in series are used in still another dry pelletizing process. The first drum is provided with a rotating shaft extending the length of the drum which has many spirally arranged, closely spaced pins to clean any caked solids from the walls of the drum. After leaving the first drum, the pellets are finished by tumbling in the second drum, which is bare of mechanical devices.

Wet pelletizing processes use water to make a dry, crumbly, putty-like mass. Approximately equal parts of water and black are used. Wet pellets must be dried.

In one wet process, the equipment consists essentially of two horizontal rotating cylinders, 4 ft. by 11½ ft., one above the other, each fitted with inwardly projecting radial pins. A central shaft in the upper cylinder is provided with radially projecting pins and turns in an opposite direction to the cylinder. In the lower cylinder the internal shaft is stationary and is offset several inches from the axis. The fingers on this shaft are arranged in a straight line along the shaft. Carbon black fed to the upper cylinder is wetted by a series of water sprays. Crude wet pellets formed in the upper cylinder are discharged continuously into the lower cylinder, where the pelletizing is completed.

In another wet process carbon black and water are mixed into a pasty mass which is then pelletized by intense agitation in a trough equipped with a rotating spiked shaft.

Lost: one drum of pellets

A real difficulty in pelletizing operations is that the pellets are sometimes "lost," and when this happens, no further pelletizing action occurs. To get going again, you must dump all the black from the drum, charge it with previously pelletized black, and then resume the flow of loose black into the drum. One company uses a device, essentially a screw feeder down the center of the drum, for continuous seeding.

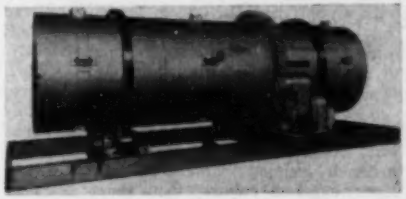
Drum dimensions

Pelletizing drums vary widely in dimensions and throughput capacity, depending largely upon the type of black concerned. In general, 10 to 12-ft. dia. drums are used for oil blacks and 5 to 6-ft. dia. drums for channel blacks. Large diameter drums are usually shorter than small diameter drums. Residence time varies from 12 to 36 hr.

In one installation the drums are 10 ft. dia. by 12 ft. long, rotating at 4 to 5 rpm. Each drum will handle from 10,000 to 12,000 lb. per day. Another company found this size drum inadequate and increased the length to 24 ft. Each drum handles 8,000 to 12,000 lb. per day. Optimum bed depth is from 15 to 18 in.

Drum capacities

In a small-diameter installation, the drums are 6 ft. dia. by 48 ft. long, rotating at 18 rpm. The faster rotating speed is characteristic of smaller diameter drums. Throughput is about 10,000 to 15,000 lb. per day.



FERTILIZERS in granular form are more easily distributed, reduce dusting losses.

GRANULATION OF FERTILIZERS

As applied to fertilizers, the term granular is commonly used to describe products which have mean particle sizes greater than are customarily associated with such products, whether this increase results from agglomeration of fines or from mechanical separation of the fines from the main body of material.

Britain is ahead

Our attention here will be limited to granulation as a method of agglomeration or pelletizing fertilizers by tumbling. The usual product size is 1 to 4 mm. The advantages of granulated fertilizer are its lower caking tendency, less dusting loss, and greater ease with which uniform distribution can be accomplished in the field. The greatest commercial development of granulation has occurred in Great Britain, where approximately 75 percent of all mixed fertilizer is so produced.

Agglomeration can be done in pan mixers or rotary drums. A typical pan is 7½ ft. in diameter by 18 in. deep and is charged with ¼ to 1 ton of material. Rotation of the pan and its eccentric mixing blades in opposite directions maintains the charge in a constant state of agitation. The pan turns at 7 rpm. and the blades at 35 rpm. Under these conditions and depending upon the type of material being treated, the addition of water to an over-all moisture content of 12 to 20 percent produces the degree of plasticity required for the formation of agglomerates. Agitation is continued for 2 to 3 min. to complete agglomeration and compact the agglomerates. The firm, moist, sticky granules formed are discharged through a floor valve to a smoothing hopper and fed at a controlled rate to a dryer. Production rate is about 7½ tons per hr.

Rotary process

In the rotary process the dry, finely divided mixture is fed at a uniform rate to a slightly inclined rotating cylinder, the first 4 or 5-ft. section of which is equipped with lifting flights for advancing the material. Such granulators vary in size but a typical one, inclined at 2 deg. from the horizontal and rotating at 8 rpm., is

6½ ft. dia. by 18 ft. long and can produce 20 tons per hr. Retention time is about 2 to 3 min.

Control by appearance

The operator, stationed at the discharge end of the granulator, controls the continuous addition of water to the material in the section provided with flights, on the basis of the appearance of the moist granules as they approach the outlet. A buildup of skin or mud is maintained on the smooth-walled section of the granulator to reduce slippage of the material and promote the necessary rolling and tumbling action.

Cost of a complete granulation installation put into operation last year in the Midwest was about $130,000. Included in this figure are the feed bin, mixer, granulator itself, Roto-louvre dryer, screen, pulverizer, and cooler. Rated capacity is 15 tons per hr. of granular fertilizer.

The moisture required to get a good granulation varies with the particular fertilizer mixture. Mixtures which consist largely of inorganic materials granulate more readily and with a lower moisture content than those relatively high in organic materials. Mixtures which are all inorganic can be granulated with 10 percent moisture. When a substantial proportion of an organic material like peat is present, the required moisture may be as high as 25 percent.

Minimum moisture content

With any mixture there is a certain minimum moisture content below which the material will not granulate regardless of the temperature or the time of rolling. At this point of minimum moisture content the granules produced are small and will not increase in size even with continued rolling.

TACONITE concentrate is rolled into balls suitable for blast furnace charge.

BALLING OF ORES AND COAL

Agglomeration of ores and coal products has been done for many years, using such methods as sintering for ores and briquetting for coal. Tumbling processes which produce pellets and balls have recently been developed and seem to offer definite economic advantages.

Like a snowball

The Mines Experiment Station of the University of Minnesota has been engaged for several years in a study of pelletizing of taconite concentrate. In the beginning, results were very discouraging. It was not until the entire concept of pelletizing was modified that real progress was made. This new concept is based on the methods used when you roll up a big snowball on the ground. If the snow on the ground is deep, you can make a big snowball quickly, but it is likely to be irregular and soft. If the snow is thin, however, you may have to roll a lot longer, but your ball will be round and strong.

Experimental findings

Tests made with a 3-ft. dia. by 6-ft. long rotating drum yielded these basic findings:

1. Taconite must be practically all finer than 65 mesh, and 60 percent or more must pass a 325 mesh screen. It should contain about 10 percent moisture.

2. Inner surface of the drum must be of such a nature that the ore rolls and cascades upon it continually but does not slide.

Optimum speed

3. Drum speed that produces the maximum rolling action is dependent upon the size of the drum and the load of material within it. The optimum speed is a peripheral velocity of about 225 fpm.

4. The flatter the drum slope, the longer the retention time of the balls during each pass through the drum and, therefore, the larger the balls produced.

5. Screen for removing undersize should be a shaking screen or trommel. A high-speed vibrating type tends to bring the moisture in the balls to the surface, making them muddy and sticky.

6. A large circulating load of screen undersize is desirable—100 percent or more not being excessive.

A consideration of these requirements might lead to the conclusion that the balling operation is delicate and requires accurate controls. This is not necessarily the case. The adjustments are simple and obvious. If the speed of the drum is too high, the balls are thrown about, and it is clear that they are being broken. If it is too low, the balls will be of a great variety of sizes, some as big as footballs. If the slope is too steep, the circulating load will become excessive. If the ore is too wet, balls will form rapidly, but they will be soft. If the ore is too dry, balls will form slowly and they will be hard, but they will also be too brittle to withstand handling.

Condition of surface

If the inside surface of the drum is not in proper condition, the whole balling operation fails and no change in moisture, speed, or slope will compensate. The fine, damp concentrate tends to pack into large lumps and ridges and builds up until these are so heavy that they fall off, causing irregular lumps and large misshapen balls to appear in the product.

It was not until a leveling device was set inside the drum to keep the surface of the ore relatively smooth and the ore layer of a definite thickness that consistent results could be secured. A continuous scraper was not the answer since this tended not only to level but also to smooth the surface. This reduced the coefficient of friction between the charge and the surface to such an extent that the charge tended to slide rather than roll.

Leveling bar

The best solution seemed to be to use a movable leveling bar with cutters. This bar extended the length of the drum and was located

a few inches from the inner surface. It was so mounted that it could be moved lengthwise parallel to the drum a foot or so by a suitable mechanical means. Cutting tools were mounted on this bar at intervals so that when the bar was moved a full stroke the cutters covered the whole length of the drum. By adjusting the speed of travel of the bar, the width of the cutters, etc., the operator could maintain a uniform surface on the inside of the drum having the desired coefficient of friction high enough to prevent slipping.

The 3-ft. dia. by 6-ft. long drum has been operated at various rates up to 4 or 5 tons per hr. At the higher rates the balls are not firm and well formed, but at anything up to 3 tons per hr. the product is entirely satisfactory.

Drum size vs. capacity

From a study of the action of the balls in the drum it might appear that drum capacities should be proportional to drum volume. For two drums of different volume but of similar proportions operating at the same peripheral velocity, this rule might be true if the size of the balls was also increased in the same proportion. But such large balls are not wanted.

Much of the time required to produce a ball is consumed in forming the nucleus or seed around which the ball forms, and the early growth of this seed is slow. In other words, the rate of growth of a ball is probably not a straight-line function of retention time. This makes the problem of estimating drum capacities difficult, even when data are available from a pilot plant. It is known, however, that an 8-ft. by 16-ft. drum has a capacity of something over 20 tons per hr. This would indicate that drum capacities increase by something like the cross-sectional area rather than the volume.

TVA experience

TVA's experimental tumbler for agglomerating phosphate fines was a 3-ft. dia. drum. It consisted of two sections: a pelletizing section, 5½ ft. long, which had six 2-in. lateral flights, and a screen section, 3 ft. long. A 9-in. retaining ring at the feed end and a 6-in. ring between the two sections provided for retention of a 6-in. depth of material in the pelletizing section. The drum was set at a slope of ½ in. per ft. and was driven by a 1½-hp. motor at 4 to 16 rpm.

Clay binder used

Exploratory work indicated that all but the finest phosphate sands required a plasticizing treatment before they could be pelletized in the tumbler. The addition of a binder, such as clay-containing materials, provided a mixture that could be pelletized. Treatment for a few minutes in a pan mixer prior to agglomeration developed plasticity in coarse sands, improved the plasticity of fine sands, and blended intimately the ingredients of sand-binder mixtures.

For each type of plasticized phosphatic material there was a moisture content range, usually 15 to 20 percent, in which satisfactory pellets were formed. Beyond the upper limit, large, sticky balls were formed which had little mechanical strength. When the moisture content was too low, pellets either were not formed or had too little plasticity to hold together.

Effects of moisture

Ores which are to be sintered are sometimes premixed in pelletizing drums. A standard machine has been developed, consisting of a slowly revolving drum equipped with internal paddles which rotate rapidly in the reverse direction. The drum carries the charge up to the paddles, which then throw it back on itself and into a water spray. The small pellets produced form a uniform permeable bed for sintering.

A series of standard sizes has been developed by a manufacturer of sintering machines. Capacities expressed in Table IV are in terms of sinter charge, which does not require complete pellet formation. If complete pelletization is wanted, capacities will be about half of these.

Table IV—Sizes of Sinterite Pelletizers

Diameter, In.	Length, Ft.	Capacity, Tons/Hr.
24	4	1 to 3
30	5	3 to 10
36	8	8 to 12
48	8	10 to 15
60	10	15 to 25
72	12	15 to 40
96	15	40 to 60

A low-temperature coal carbonization process forms coal into balls in rotating retorts. The retorts are 9 ft. dia. by 126 ft. long and turn at a peripheral speed of 75 fpm. Retention time in the retorts is about 1 hr. Production per retort is about 150 tons per day.

Operation Rockball

The operation is conducted at a temperature at which the coal softens and begins to melt. During the process the mixture becomes like stiff dough, breaks into smaller pieces, becomes rounded or pelletized, sets, and is discharged as balls or eggs ranging from a fraction of an inch to 8 to 10 in., weighing 10 lb. or more.

The product is classified into various size grades and sold as domestic smokeless fuel. It is competitive with coal briquettes; retail price, in fact, is less than the price of briquettes.

Cheaper by tumbling

OTHER TUMBLING APPLICATIONS

Agglomeration into spheres by tumbling can be effected by other means than those mentioned in connection with carbon black, fertilizers, ores and coal. Sometimes the agglomeration is incidental, sometimes even undesirable.

Conical blenders, while primarily designed to blend dry, free-flowing solids, can and have been used to make agglomerates by adding small quantities of liquid binder. Heavy-duty kneaders can also be used for agglomeration. In some processes the agglomerates may actually be desired, or they may be the only form in which the kneader can deliver the end product.

Chemical pellets

The mushroom mixer has been successfully used to pelletize phthalic anhydride and ferric sulphate. Binder for phthalic anhydride is molten phthalic anhydride and for ferric sulphate is water. The ferric sulphate operation used a mixer 4½ ft. in diameter rotating at 15 rpm. Production rate was 2 tons per hr. of 4 to 8-mesh pellets. This method is the subject of U. S. Patent 2,436,771, claiming a method of feeding and a speed of rotation which promote pellet formation without causing the material to stick to the walls of the drum.

The Carburolith process, under development at Southwest Research Institute, makes pellets by coating them with an alginate. This might eventually be a practical way to make fragile pellets more durable.

Sintering Is Widely Used for Ores

Incipient fusion of the material itself or an added agent binds the particles together into porous masses.

Although processes involving complete fusion are considered outside the definition of agglomeration, processes involving sintering or incipient fusion are commonly used for agglomerating inorganic solids, especially iron ore. The production of iron ore sinter now amounts to more than 20 percent of iron ore shipments from the Lake Superior ranges.

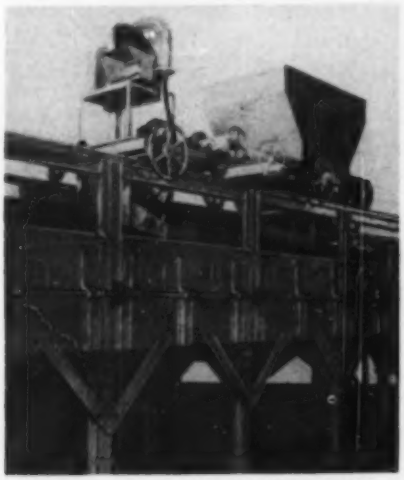
Self-binding

Sintering, in effect, binds small particles together into an agglomerate in which some of the material itself or an added agent has been melted to form a binder. Product size depends upon the extent of fusion, which in turn depends upon the time and temperature conditions of the operation; sintering equipment is designed so that these variables are under close control. Temperatures as high as 1,700 deg. C. are sometimes used, although 1,100 deg. C. is sufficient for sintering iron ore.

Chemical reactions

Sintering operations may be combined with or incidental to the carrying out of chemical reactions. In the sintering of sulphur-bearing ores, the sintering step includes roasting of sulphides to oxides. The reaction becomes self-sustaining if the charge is rich enough in sulphur. In the manufacture of portland cement, the reactions between the various minerals occur at temperatures where melting begins, forming the hard, granular masses which the cement people call clinker. A new type of phosphate fertilizer is made by sintering a mixture of olivine (a natural magnesium silicate) and phosphate rock.

Types of equipment commonly used for sintering operations are rotary kilns, stationary hearths and moving bed machines.



BATCH operation of stationary hearth takes about 30 min. per cycle.

STATIONARY SINTERING HEARTHS

If the material to be agglomerated contains sufficient combustible material, it can be sintered by the heat liberated when the combustible material burns. Some materials already contain enough carbon or sulphur, otherwise solid fuel is added as required. Sintering can be done on either stationary or moving bed machines.

The stationary sintering hearth consists of rectangular steel compartments enclosed with air-cooled cast iron liners; a suction box with air manifold connected to an exhaust fan; an inclined hearth of slotted cast iron grates; and traveling charging car and oil or gas-fired ignition burner.

Operating cycle

The operator spreads a layer of material on the hearth and levels it to a uniform thickness. He ignites it by moving the burner slowly along the bed, aided by the pull of the exhaust fan. When ignition is completed, he shuts off the burner, but combustion continues until the combustible material is consumed. The sinter is discharged by hand or by suitable mechanical means. A typical time schedule is 30 min. for a complete cycle of operations.

Gas temperature at the exhaust fan varies during the cycle and toward the end may be as high as 500 deg. F. A special heavy-duty fan is fitted with radiation cooling shields; there is no need, therefore, to provide for cooling of the exhaust gases.

The temperature developed in the bed may be sufficiently high to volatilize materials like arsenic, antimony and cadmium. The fume is collected in bag filters, requiring here that the gases be cooled down to 200 deg. F.

In addition to straightforward agglomeration of ores and volatilization sintering, there are various chemical applications of sintering hearths, such as chloridizing roasting, alkaline fusions and calcinations. With tungsten minerals, for example, the ground ore is mixed with sodium compounds such as salt cake and soda ash and about 8 percent coal. During sintering, the tungsten is converted to sodium tungstate, which is recovered by leaching. Another application of sintering hearths is in the production of lightweight aggregate from clay.

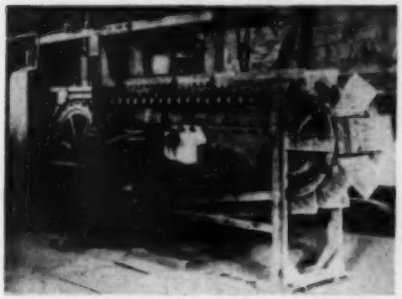
Good mixing required

Thorough mixing of the charge is important, particularly when several materials are treated together. Sufficient water must be added to dry materials so they will stick together slightly. This may be from 5 to 20 percent. The preferred type of mixer is the pug mill.

Table V—Characteristics of Stationary Sintering Hearths

Grate Area	Nominal Capacity, Tons/Per 24 Hr.	Fan Hp.	Approximate Fob. Cost
10 x 16 in.	Laboratory model	1	$750
2½ x 5 ft.	5 to 8	7½	1,650
4 x 5 ft.	15 to 20	10	4,400
4 x 10 ft.	35 to 50	20	8,800
4 x 20 ft.	75 to 90	40	13,000
4 x 30 ft.	125 to 150	60	18,000
4 x 45 ft.	170 to 225	90	25,000
4 x 60 ft.	250 to 300	120	31,000

Cost data Costs and dimensions of standard machines are given in Table V. Capacity figures in this table are based on 1 ton of feed per sq. ft. of grate area per 24 hr. The lower figure is for sulphides and the higher figure is for oxides. One operator per shift is usually enough if suitable materials handling equipment is provided.



CONTINUOUS sintering involves a traveling hearth. This machine is a pilot plant unit.

MOVING BED SINTERING MACHINES

The batchwise operation of the stationary sintering hearth is duplicated on a continuous basis with moving bed machines. The machine itself consists of a steel framework supporting a closed track around which travel a series of small grate-bottom pallets. Suction boxes beneath the upper pallet track section are connected to an exhaust fan.

As an empty pallet passes under the feed hopper, it received a charge of prepared ore. The pallet then passes under the igniter, where a flame is directed upon a small area of the top surface. Continuing over the suction boxes, the charge is sintered by the combustion of the fuel in the bed.

Control by speed The operator regulates the speed of travel so that the pallet leaves the suction box as soon as the charge has been completely sintered. Other controls are depth of bed, proportion of fuel, moisture content of charge, etc. Bed depth may be in the range of 5 to 12 in. Product size after screening runs from ¼ in. to 1 in. or more.

As shown in Table VI, moving bed machines can be built for a wide range of capacities, up to 63 tons per hr. on ores. Linear speed depends upon sintering time required and length of machine. Sintering times vary from 5 to 20 min. Although the machine operates continuously, it can be shut down and started up so easily that single or two-shift operation is entirely practical.

More cost data Plant costs vary greatly. A simple plant may cost as low as $500 per daily ton. More elaborate plants, complete with auxiliaries such as trackage and substation, will run from $2,000 to $2,500 per daily ton. A 1948 TVA estimate placed the cost of a unit for agglomerating phosphate fines at $613,000 for 633 tons per day, or $968 per daily ton.

TVA operated a 42-in. by 55-ft. machine on an experimental basis. Per ton of product, operating labor was 1.1 man-hr., maintenance labor was 0.2 man-hr., and power was 27 kwh.

Table VI—Standard Sizes of Moving Bed Sintering Machines

Size	Nominal Capacity, Tons Per Hr.	Gas Volume, Cfm.	Fan Hp.
42 in. x 11 ft.	3	7,500	50
42 in. x 22 ft.	6.5	15,000	100
42 in. x 33 ft.	10	23,000	150
42 in. x 44 ft.	13	31,000	175
60 in. x 44 ft.	18	45,000	250
60 in. x 66 ft.	27	66,000	350
60 in. x 88 ft.	36	88,000	475
60 in. x 110 ft.	46	110,000	600
72 in. x 63 ft.	33	75,000	400
72 in. x 81 ft.	41	100,000	550
72 in. x 99 ft.	50	120,000	650
72 in. x 126 ft.	63	150,000	800

Most iron ore agglomerating plants operate on a 20 shift per week basis with one turn down for scheduled repairs and maintenance. The chief items for repair are grate bars, mixer paddles, fan impeller, and pallets.

Processing applications Besides iron ore sintering, this machine is also used for roasting sulphide ores and can be adapted to recovery of the SO_2 produced. Nonmetallurgical uses include calcining limestone fines, burning portland cement clinker, production of aluminum sulphate, and production of lightweight aggregate. A new process for recovery of waste iron sulphate uses this machine to decompose the ferrous sulphate into sintered iron oxide and SO_2.

ROTARY KILN sintering requires occasional removal of crust with water-cooled boring bar.

SINTERING IN ROTARY KILNS

Also nodulizing Rotary kilns are used extensively for sintering various ores and refractory oxides. This operation is often called nodulizing, but there does not seem to be any logical reason for such a distinction.

Some sintering operations can be carried out satisfactorily in standard rotary kilns, as the manufacture of cement. When using a plain kiln, however, certain operating difficulties may be encountered. These are primarily caused by the adherence of sticky material to the firebrick lining near the discharge end of the kiln. This coating may reach such a proportion after 5 to 7 days as to prevent the material from passing through the kiln at the proper rate, making it necessary to shut the kiln down, let it cool off,

and actually clean out the ring by manual labor.

Removal of crust

A special design of kiln and special firing methods have gone a long way towards overcoming this problem. A special shape of the kiln causes the sinter to form in a short section close to the discharge end and only a small amount adheres to the kiln lining. Although the adhering material has a tendency to build up gradually, a powerful water-cooled boring bar is forced into the kiln for removal of the crust.

The boring bar is mounted on a motor-driven carriage, permitting relatively slow forward movement of the bar during scraping and quick withdrawal after scraping. This operation, which lasts 15 to 20 min. and takes place while the kiln rotates, is normally carried out once or twice during each shift and involves no change in the operating conditions of the kiln.

Firing methods

Two distinctly different firing methods are used, depending upon the type of fuel. If the fuel is rich, such as pulverized coal, oil, natural gas, or coke oven gas, the firing temperature will be sufficiently high; you must still concentrate the flame sufficiently to get a short sintering zone. However, when a poor fuel such as blast furnace or producer gas is used, the feed to the kiln should contain a combustible solid. Blast furnace fines usually already contain enough carbon, but a few percent of coke breeze or anthracite is added when agglomerating other ore fines.

Rotary kiln sintering is economically attractive for large volumes; units with as much as 1,000 tons per day capacity are possible. Labor requirements are very low. Power consumption is about 7 to 8 kwh. per ton of product. Disadvantages are the high capital cost in small capacities and the fact that one or two-shift operation is impossible. The latter objection is of hardly any consequence to most chemical operators.

Effects of bonding agents

Among materials agglomerated in rotary kilns are blast furnace dust, iron ore fines, phosphate fines, manganese flotation concentrates, dolomite, and periclase. Lime and magnesia have such high melting points that they cannot be sintered properly in rotary kilns without addition of supplementary sintering agents. Iron oxide in the form of mill scale is ordinarily used for this purpose with dolomite, forming calcium ferrite. With periclase, silica is added, which forms forsterite ($2MgO\text{-}SiO_2$) as a bonding agent. Addition of 15 percent limestone will lower the sintering temperature in iron ore agglomerating kilns from 2,500 deg. F. to 2,100 deg. F.

Phosphate nodulizing

TVA's phosphate nodulizing plant includes four rotary kilns each 8 ft. dia. by 125 ft. long. The first 46 ft. from the firing end of each kiln is lined with 9 in. of superduty firebrick, and the remaining length is lined with 6 in. of stiff-mud brick. Kiln slope is ¼ in. per ft. and speed of rotation is 3 rpm. Drives are 50 hp.

The phosphate is in the kiln about 30 min. Agglomeration takes place at a hot-end temperature of 2,200 to 2,700 deg. F.

Equipment is provided for the use of powdered coal, electric-furnace byproduct CO, and oil. The practical amount of CO that can be used is limited by the necessity for maintaining the hot zone within reach of the boring bars. The CO, therefore, is supplemented by coal or oil.

Each boring bar is about 48 ft. long and is mounted so that it can be moved about 20 ft. into the kiln with a wall clearance of about 2½ in. It is made of three concentric steel pipes, so constructed that cooling water may be circulated throughout its length.

Operating costs

Production rate is about 10 tons per hr. per kiln. Per ton of nodules, TVA uses 400 gal. cooling water, 6.9 kwh. power, 0.58 man-hr. operating labor, and 0.31 man-hr. maintenance labor. It has been necessary to replace the superduty nose blocks about once every 2 months and to replace the superduty brick in the first 30 ft. from the firing end about once every 8 months. Other sections of the kiln linings last 2 years.

ACKNOWLEDGMENT

The following individuals and firms provided valuable assistance to the editors in the preparation of this report:

F. J. Bartholomew.....Chemical Construction Co.
C. E. Berry.....E. I. du Pont de Nemours & Co.
A. G. Blank.....Proctor & Schwartz, Inc.
A. C. Byrns.....Kaiser Aluminum & Chemical Corp.
H. A. Chapin.....The Mace Co.
E. W. Davis.....University of Minnesota
Howard Farkas.....U. S. Stoneware Co.
T. P. Hignett.....Tennessee Valley Authority
R. S. Hood.....Monsanto Chemical Co.
R. W. Hyde.....Sintering Machy. Co.
W. M. Jackson.....James Russell Eng. Works
K. D. Jacob.....U. S. Department of Agriculture
J. M. Joyner.....Farrel-Birmingham Co.
Gordon Kiddoo.....National Research Corp.
K. R. Komarek.....Komarek-Greaves & Co.
C. M. Lesher.....Consultant
C. R. Lockard.....Sprout, Waldron & Co.
R. W. Miller.....Southern Alkali Corp.
C. J. Murphy.....Mathieson Chemical Corp.
F. H. Paulson.....Norton Co.
P. C. Peterson.....Dow Chemical Co.
R. E. Powers.....Mellon Institute
O. C. Ralston.....U. S. Bureau of Mines
C. R. Sare.....Patterson Foundry & Mach. Co.
E. Saumenict.....International Clay Machy. Co.
Larry Schulenburg.....Monsanto Chemical Co.
J. P. Shambaugh.....Socony-Vacuum Oil Co.
R. S. Shute.....Filtrol Corp.
Donald Small.....Vulcan Iron Works
W. I. Smith.....Arthur Colton Co.
D. E. Stokes.....F. J. Stokes Mach. Co.
J. S. Swearingen.....Southwest Research Institute
D. M. Tourlson.....Welding Engineers, Inc.
G. F. Wilkins.....Gates Bros., Inc.
A. B. Zahn.....F. L. Smidth & Co.

REFERENCES

General

Perry, J. H., "Chemical Engineers' Handbook," 3rd ed., p. 1179, McGraw-Hill Book Co., 1950.

Stout, B. L., *TVA Chem. Eng. Rept.*, **No. 4**, 1950.

Confined Pressure

Fisher, P. L., *U. S. Bur. Mines*, **I. C. 7469**, July 1948.

Parry, V. F., *U. S. Bur. Mines*, **R. I. 3787**, June 1944.

Silver, J. A., and Clarkson, R., "Manufacture of Compressed Tablets," F. J. Stokes Mach. Co., Philadelphia, 1944.

Extrusion

Bartholomew, F. J., *Chem. Eng.*, Aug. 1950, p. 118.

Drogin, I., "Developments and Status of Carbon Black," United Carbon Co., Charleston, W. Va., 1945.

Tumbling

Anon., *Chem. Eng.*, Feb. 1951, p. 150.

Cox, J. T., Jr., *Chem. Eng.*, June 1950, p. 116.

Davis, E. W., and Wade, H. H., *Univ. of Minn. Mines Expt. Sta.*, **I. C. No. 6**, Jan. 17, 1951.

Drogin, *loc. cit.*

Hardesty, J. O., and Clark, K. G., *Agric. Chem.*, **6**, No. 1, 34 (1951).

Hardesty, J. O., and Ross, W. H., *Ind. Eng. Chem.*, **30**, 668 (1938).

Kiddoo, G., *Chem. Eng.*, Mar. 1951, p. 104.

McBride, R. S., *Chem. Eng.*, June 1949, p. 112.

Sherwin, K. A., and Steventon, J. W., *Proc. Soc. Chem. Ind.*, **31**, 1 (1949).

Sintering

Anon., *Steel*, Dec. 20, 1937.

Bartholomew, *loc. cit.*

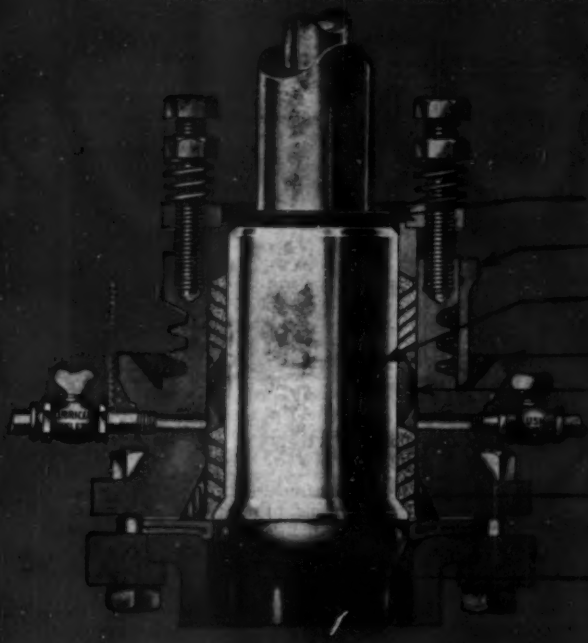
Byrns, A. C., *Chem. Eng.*, May 1950, p. 152.

Flint, E. P., *Brick & Clay Rec.*, Apr. 1950, p. 67.

Powers, R. E., *A.I.E.E. Tech. Comm. Act.*, p. 185, 1950.

Thyrre, S. G., *Blast Furn. & Steel Plant*, Mar. 1941.

THE PFAUDLER HIGH-DUTY STUFFING BOX



THE PFAUDLER LOW-DUTY STUFFING BOX →

To meet special low-pressure chemical conditions, a variety of packing materials, sealer rings and lubricants are available for Pfaudler low-duty stuffing box.

Mounted on this glass-lined reactor, the Pfaudler high-duty stuffing box is completely accessible for repacking and inspection.

WHY PFAUDLER STUFFING BOXES
give longer service under severe conditions

Highly corrosive chemicals make extreme demands on the stuffing boxes of your reaction equipment . . . especially when operating under pressure. The packing and lubricant are particularly susceptible to chemical attack on severe service . . . and the length of service obtained with ordinary materials very short.

The Pfaudler high-duty stuffing box is specially built to withstand pressure and temperature extremes. Automatic lubrication keeps it flooded with lubricant. And particular attention has been given to the packing. In order to offer a material of full chemical resistance, Pfaudler has developed a special process for making an effective packing of pure Teflon. It employs no binder, but the ring itself is porous so that the lubricant can work through slowly and be present at the contact surface at all times.

The self-centering "no-play" bearing and combination lantern ring in the Pfaudler high-duty stuffing box keep the agitator shaft running true. This eliminates weaving which would destroy the flexibility of the packing.

Replaceable sleeves of Hastelloy or other resistant materials are affixed to the agitator shaft. These prolong the life of the agitator by protecting against corrosion at the point where the agitator enters the stuffing box. The steel agitator stem is accurately machined to give shrink fit and to correct warpage after the glass coating has been applied. Both the agitator end and the conical ring in the bottom of the stuffing box are glass coated. Whenever needed, a water jacket can be easily clamped on.

In addition, special lubricants and counter balance systems can be supplied. And rotary seals are available for reactions where complete elimination of lubricant leakage is required.

To meet a wide range of reaction requirements efficiently and economically, Pfaudler also offers a standard stuffing box. This is suitable for mild services where pressures do not exceed 10 psi. For full details, just send us the handy coupon below.

Pfaudler

THE PFAUDLER CO., ROCHESTER 3, N. Y.

ENGINEERS AND FABRICATORS OF CORROSION RESISTANT PROCESS EQUIPMENT

GLASS LINED STEEL • Hastelloy • Aluminum • Tantalum • Teflon

Carbon Steel • Solid or Clad Stainless Steel • Nickel • Inconel • Monel

THE PFAUDLER CO., Dept. CE-10, Rochester 3, N. Y.

Please send me more information on Pfaudler Stuffing Boxes, Packing, Lubricants and Lubricating Devices.

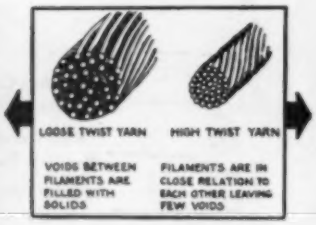
Name_____

Company_____

Address_____

City_____ Zone____ State_____

NEW PROCESSING EQUIPMENT


LOOSE TWIST YARN
HIGH TWIST YARN
VOIDS BETWEEN FILAMENTS ARE FILLED WITH SOLIDS
FILAMENTS ARE IN CLOSE RELATION TO EACH OTHER LEAVING FEW VOIDS

New Filter Fabrics Have Tighter Twist

Most of liquid flows through apertures, very little through the yarn itself. Yarn doesn't get plugged with solids.

(176A) The latest twist in filter fabric construction is more twist. A new type of fabric construction, developed especially for use with process filters, is now on the market.

Look at the pictures above: At the left is a conventional filter fabric, greatly magnified, constructed of 600-denier synthetic yarn having ¼ turn per in. or length. Note that adjacent yarn strands are packed tightly together and that any apertures that may exist are extremely small. Filtration action with this fabric, therefore, takes place, for the most part, on and through the yarn strands.

The fabric at the right is also constructed of 600-denier synthetic yarn, but you can see a big difference—here the yarn has a much greater twist, about 25 turns per in. Note that the highly twisted dense yarn strands are rigid to the extent that they do not pack tightly together, except at the binding points. Definite apertures exist between the strands.

What advantages does this new filter fabric construction offer to the process industries? By greatly altering the relative proportions of fluid flowing through the strands vs. fluid flowing around the strands and through the apertures, the new fabric greatly reduces loading of the yarn with solids, precipitation of solids in and on the surface of the yarn, and problems presented by action of fungi, algae and bacteria. Flow rate is greater, cleaning of the cloth is easier, and life of cloth is longer. In short, claims the manufacturer, filtration is cheaper.

Here is how this development came about: Measurements made with a relatively closely woven cotton duck or a light cotton muslin or twill fabric indicated that 95 to 98 percent of the total flow of filtrate actually passed through the yarn strands, with only 2 to 5 percent of the flow passing through the apertures of the fabric. Linen, silk, rayon, and wool fabrics showed nearly the same results.

The first attempt to improve this situation was construction of a fabric with monofilament synthetic yarn. Difficulty of yarn loading would, of course, be eliminated. However, tightly woven fabrics could not be made of monofilaments unless the filaments were of such small diameter that the fabric had low mechanical strength.

The next idea, which proved to be the answer, was to apply sufficient twist to multifilament yarns so as to approach a monofilament in effect and still retain some of the flexibility of a multifilament yarn for weaving purposes.

All available synthetic filter fabrics at that time were constructed of yarn having ¼ to 3 turns per in. of length. This is the usual amount of twist applied by the yarn manufacturer to hold the filaments together. Tests with tightly woven synthetic fabrics with the conventional low twist gave results which were little different from those obtained with cotton fabrics.

Upon increasing the twist to 15 per in. in a 60 to 70-denier yarn, however, the proportion of filtrate passing through the strands was reduced to 70 percent, with 30 percent through the apertures. These results were encouraging, so more twist was applied. With the same denier yarn but now with 35 turns per in., the flow through the yarn was only 2 percent, with 98 percent through the apertures.

The technique used in these tests was to saturate the yarn with a solvent-soluble sizing before the actual weaving operations to produce an essentially impervious yarn. Rate of flow through the apertures was then measured. The sizing was removed with a suitable solvent and the flow rate test repeated. The difference between the two represented the flow through the yarn.

The optimum amount of twist depends largely upon the denier of the yarn. A 30-denier yarn will have a twist of 15 to 40 turns per in., whereas

Equipment Cost Indexes

(Marshall and Stevens Indexes of Comparative Equipment Costs, 1926 = 100)

Industry	Sept. 1950	June 1951	Sept. 1951
Average of all.....	171.5	180.9	179.1
Process Industries			
Cement mfg.	163.4	173.1	171.5
Chemical	171.4	181.1	179.5
Clay products	158.4	169.1	166.5
Glass mfg.	161.5	171.2	169.6
Paint mfg.	164.7	174.4	172.8
Paper mfg.	165.0	174.7	173.1
Petroleum ind.	167.8	177.5	175.9
Rubber ind.	170.2	179.9	178.3
Process ind. avg....	168.9	178.5	176.9
Related Industries			
Elec. power equip..	173.0	182.7	181.1
Mining, milling	172.1	181.8	180.2
Refrigerating	190.8	200.5	198.6
Steam power	160.1	170.3	168.7

Compiled quarterly for March, June, September, and December of each year by Marshall and Stevens, evaluation engineers, Chicago and Los Angeles. Indexes are prepared for 47 different industries, from which the eight process and four related industries listed here are selected. Published each month with the latest available revision. For a description of the method of obtaining the index numbers see R. W. Stevens, **Chemical Engineering**, Nov. 1947, pp. 124-8. For a listing of annual averages since 1913 see **Chemical Engineering**, Feb. 1951, p. 188.

a 1,200 denier yarn will have only 4 to 10 turns per in.

The new filter fabrics are currently being produced in some 20 different constructions of nylon, Orlon, Vinyon, Dacron, and saran. You can get them either in bulk or tailored to your individual needs.—*Equipment Development Co.*

Vacuum Flash Evaporator Removes Volatiles From Oils

(*177A*) A vacuum flash evaporator for separating gases or volatile liquids from oils and other high-boiling liquids has recently been developed. The preheated feed is introduced into a rotor which atomizes the liquid and projects it into a zone of reduced pressure. Dissolved gases and low-boiling liquids flash quickly into the vapor space and are withdrawn through the vacuum system. On the same shaft as the atomizer rotor is mounted a centrifugal pump impeller for pumping the dry liquid through a cooler to storage. Outflow is regulated by a level controller.

A number of units have already been installed for dehydrating lubricating oils, transformer oils, and sulphonates, for deodorizing oils, and for removing alcohol from oils. The high degree of atomization obtained suggests potential application of this device to stripping operations and to gas-liquid reactions. For such applications the vacuum equipment would probably not be used.

For vacuum dehydrating, a two-stage steam ejector is normally used, maintaining a vacuum of 28 in. in the evaporator. The rotor shaft is sealed by a double mechanical seal with integral seal oil set to guard against leakage of air into the system. The shaft may be motor or turbine driven.

Standard evaporators are 4, 6 and 8 ft. in diameter, with driving motors of 15, 30 and 60 hp. Rated capacities in terms of water evaporated when dehydrating oil are 187.5, 375 and 750 lb. per hr.—*Stratford Engineering Corp.*

Continuous Drying Tunnel Uses Dehumidified Air

(*177B*) A new continuous tunnel for drying heat-sensitive materials uses very dry air instead of hot air to provide the humidity difference necessary for mass transfer of water vapor. The air is dehumidified by a Kathabar system, which uses a hygroscopic lithium chloride solution to absorb the moisture. The Kathabar system is widely used for drying of air in industrial and comfort air conditioning.

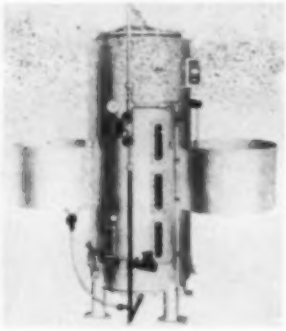
In the new dryer, dehumidified air enters the tunnel at practically room temperature. However, to maintain the moisture-absorbing capacity of the air at a high level, the air is heated slightly throughout the dryer by steam heaters placed along the tunnel.

All the dryer installation equipment is available as a single unit.—*Surface Combustion Corp.* (*Continued*)

IN BRIEF—A capsulated listing of this month's newsworthy equipment.

		Page
Processing Equipment		
Filter Fabrics	High twist prevents plugging of yarn with solids	176A
Vacuum Flash Evaporator	Dehydrates and deodorizes oils	177A
Continuous Drying Tunnel	Heat-sensitive materials dried with dehumidified air	177B
Demineralizing Unit	Deionizes water in single pass	178A
Column Packing	Wire gauze rings show high fractionating efficiency	178B
Instruments and Controls		
Reclosing Relay	Automatically tests circuits at specified intervals	178C
pH Meter	Designed for rough plant and field service	178D
Network Analyzer	Analog computer solves pipeline problems	178E
Field Manometer	Rolls up to pocket size	180A
Flowmeter Tube	Produces extremely low over-all head loss	180B
Arctangent Graph Paper	For plotting functions which approach infinity	180C
Infrared Analyzer	Continuous, for plant process control applications	180D
Sonic Meter	Indicates ultrasonic power directly in watts	180E
Remote Dynamometer	Measures tension, weight, or tractive loads	180F
Heating and Cooling Equipment		
Combination Burner	Uses either oil or gas interchangeably	182A
Lacquer Heater	Facilitates spraying of high solids content lacquers	182B
Insulating Cement	For temperatures to 1,000 deg. F	182C
Insulating Cement	For temperatures to 1,700 deg. F	182D
Hollow Screw Heater	For processing pastes, sludges, and solids	182E
Portable Oven	Operates on 110 v., up to 800 deg. F	182F
Unit Coolers	New models for either ammonia or Freon	182G
Condensate Return Unit	Handles hot water without vapor lock	182H
Materials of Construction		
Fume Ducts	Fabricated completely of tough, rigid plastic	184A
Aluminum Casting Alloy	Mechanically strong up to 600 deg. F	184B
Acidproof Joint	Wrapped joint for resin-base piping	184C
Ceramic-Coated Steel	Used in place of scarce alloys	184D
Safety Equipment		
Safety Signs	With special warning and directional messages	186A
Plastic-Coated Gloves	Can be worn on either hand	186B
Safety Goggle Pliers	Facilitate repair of spectacle type goggles	186C
Fire Extinguisher	Can be picked up and operated with one hand	186D
Canvas Sandals	Reduces the danger of slipping on wet floors	186E
Gas Mask Canister	Superior adsorbent for ammonia fumes	186F
Packaging and Handling Equipment		
Stainless Steel Drum	Carried easily, stacked safely	186G
Overhead Chain Conveyor	Three wheels make for easy turns	186H
Conveyor Chain	With flat top, flexes in two planes	188A
Lithographed Drums	With colorful, detailed trade-marks	188B
Keg Pallet	Carries six kegs at a time	189A
Conveyor Belt Cleaner	Wipes belt clean on return run	189B
Electric Trucks	Capacities to 4,000 lb., lifting heights to 121 in.	189C
Canned Bearings	Will not deteriorate during storage	189D
Flow Diverter	Used with gravity roller conveyors	189E
Electric Pallet Truck	Permits operator to ride	189F
Fluid Flow Equipment		
Sludge Pump	Pushes thick sludges and pastes through pipelines	190A
Centrifugal Pumps	Close-coupled, with mechanical seals	190B
Multi-Stage Pumps	Opposed impellers for balanced thrust	190C
Reciprocating Pumps	With 6-in. stroke, 3 to 9 plungers	191A
Forced Draft Fan	Improved features for higher efficiency	191B
Electrical and Mechanical Equipment		
Vertical Turbine	Develops up to 90 bhp	192A
Air Cleaner and Dryer	Pressure drop less than 2 psi	192B
Vapor-Cooled Transformer	Uses a fluorocarbon for cooling and insulating	193A
Copying Machine	Medium volume production up to 46-in. width	194A
Incandescent Lamp	Long-life 500-watt lamp	194B
Speed Control	Selenium rectifier provides instant starting	194C
Metallizing Unit	Features positive air and powder control valves	194D
Remote Speed Control	Packaged system, up to 5 hp	194E

Don't Forget: Reader service postcard inside back cover will bring you more information. Use these key numbers



Demineralizing Unit Uses a Mixed Bed

(178A) A new demineralizing unit uses a single mixed bed of cation and anion exchange resins in a single tank. This arrangement provides the equivalent of a number of multiple-bed systems, it is claimed. Raw water passing through the unit comes out with a mineral content of virtually zero—resistances as high as 20 million ohms per cm. have been reported. Models are available with capacity ratings up to 5,000 gal. per hr. or more, for a large variety of industrial uses. —*Penfield Mfg. Co.*

Wire Gauze Column Packing Shows High Efficiencies

(178B) Dixon gauze rings are a new random packing for small-scale fractionating columns. Made of 60 and 100-mesh wire gauze in a Lessing ring shape, they are available in nominal sizes of $\frac{1}{8}$ in., $\frac{1}{4}$ in., and $\frac{1}{2}$ in. Surface areas are reported to be 455 sq. ft. per cu. ft. for $\frac{1}{8}$-in. rings, 294 sq. ft. per cu. ft. for $\frac{1}{4}$-in. rings, and 138 sq. ft. per cu. ft. for $\frac{1}{2}$-in. rings.

The packing shows a high fractionating efficiency—84 theoretical plates per foot of height having been attained with some columns, according to the manufacturer. Performance, however, is dependent to a large extent upon vapor velocity and column diameter. Maximum permissible velocity at atmospheric pressure is about 2.0-2.3 fps., but best efficiency is obtained at velocities much lower, around 0.8 fps. Performance factors based on column diameter indicate that efficiency of a 2-in. column is 80 percent of that of a 1-in. column, while that of a 4-in. column is only 50 percent.

To achieve maximum efficiency, you must preflood the packing. One way of doing this is to start up at total reflux with an overfilled boiler, the excess liquid, when boiling, completely submerging the packing. The excess is then slowly drained from the boiler until the boiler contains the normal charge. The time taken for a column packed with Dixon rings to come to equilibrium on total reflux after preflooding is said to be about 1½ hr. per 10 theoretical plates.

The low pressure drop claimed for this packing would make it useful in vacuum work. Vapor velocity of 20 fps. can be used at 20 mm. Hg. It is thought that the approximate maximum velocity is about 40 fps. at 5-10 mm. Hg.—*Griffin & Tatlock Ltd.*

NEW INSTRUMENTS & CONTROLS

Circuit Reclosing Relay Tests at Spaced Intervals

(178C) Type HRR circuit reclosing relay automatically tests the continuity of a fault for a given number of times at specified intervals. Should the fault be cleared during any one of the trial tests, the control is restored to its normal operating condition. Should the fault persist, however, the relay automatically locks out the control circuit until the fault has been cleared manually.

When combined with various types of sensing devices, these relays can test for the continuity of normal or abnormal conditions of voltage, frequency, current, pressure, speed, weight, light, etc.—*R. W. Cramer Co.*

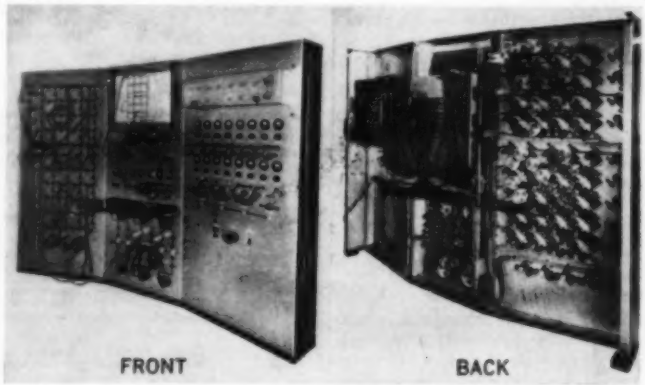
Versatile pH Meter Features Rugged Design

(178D) The newly developed Model N pH meter is a compact, portable, battery-operated instrument, designed for maximum convenience and reliability of operation. A splash-proof die-cast aluminum case encloses a precision-built electronic unit. Each tube in the unit is individually shock-mounted to withstand rough field and plant service.

The electrode support rotates alongside the case for convenience in carrying. The instrument can be used in either horizontal or vertical position. Convenient controls not only centralize all operating functions but also permit checking amplifier circuits and battery condition without opening case or disturbing battery connections. Operation is simple; after setting the temperature compensator and making a standardization against a buffer, you need only immerse the electrodes in the sample and read pH directly from a dial.

The instrument measures 4x6x9½ in. and weighs less than 8 lb. Price is $180.—*Beckman Instruments, Inc.*

(*Continued*)



NETWORK ANALYZER SOLVES PIPELINE PROBLEMS

(178E) **Invented by Malcolm S. McIlroy, now at Cornell University, the first production network analyzer unit has gone to University of Washington for analyzing pipeline networks in the Northwest. Reading directly in terms of flows and pressures, this device eliminates all calculations beyond a simple change of scale. It employs non-linear resistors which represent pipelines in an analogous electric circuit. Accuracy is well within acceptable limits.—Standard Electric Time Co.**

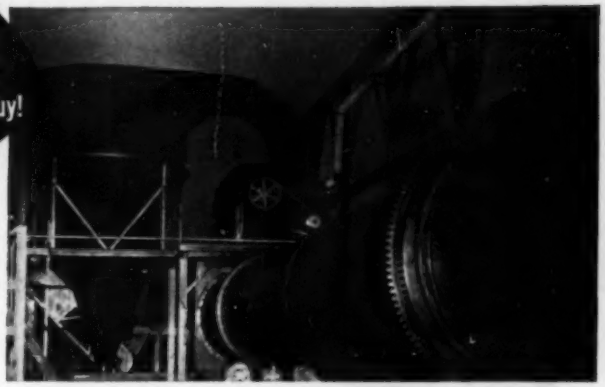
See Louisville for

CREATIVE DRYING ENGINEERING

See us at the General American Display at the 23rd Exposition of Chemical Industries, Booths 285 and 287

Tests prove "job-designed" LOUISVILLE DRYER will pay for itself in boosted production . . . in overall savings!

KNOW THE RESULTS before you buy!



FORMER DRYER

Installed cost	$109,000
Daily production (tons)	960
Drying cost per ton	.432

LOUISVILLE DRYER

Installed cost	$83,400
Daily production (tons)	1,200
Drying cost per ton	.282

YEARLY SAVINGS OF LOUISVILLE DRYER IN OPERATING COSTS ALONE $24,000

Worried over high production costs? Take a look at the performance comparison shown at the left. Here's proof that a new job-designed Louisville Dryer can lift plant production by at least 25%—will pay for itself with production cost savings in less than four years.

Call in a Louisville engineer. Let him survey your production. From his studies, a dryer can be designed to fit your specific problem. Then, in our own unique research laboratories and pilot plant, we will predetermine the performance of your new Louisville Dryer. You know the results before you buy—and the results *must* be more than satisfactory. For complete information, write today.

Other General American Equipment:
Turbo-Mixers, Evaporators, Thickeners, Dewaterers, Towers, Tanks, Bins, Filters, Pressure Vessels

Louisville Drying Machinery Unit
Over 50 years of creative drying engineering
GENERAL AMERICAN TRANSPORTATION CORPORATION
Dryer Sales Office: Hoffman Bldg., 139 So. Fourth Street Louisville 2, Kentucky
General Offices: 135 South La Salle Street, Chicago 90, Illinois
Offices in all principal cities

Field Manometer
Can Be Carried in Pocket

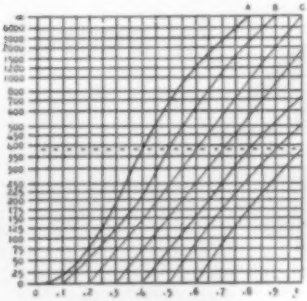
(180A) Engineers and technicians can now carry their manometers in their pockets, like a physician's stethoscope, when they go into the plant to diagnose operating troubles. A new manometer made of a vinyl plastic can be rolled, twisted, or bent into any shape, and subsequently returned to a full length, easily read and accurate U tube. The adjustable plastic scale is firmly held between the tubes.—*F. W. Dwyer Mfg. Co.*

Flowmeter Tube
With Low Head Loss

(180B) A new differential pressure producing device for use in flowmeter installations is said to operate with an extremely low over-all head loss. For an assumed example where the head loss across a long venturi is 10 units, that across a short venturi is 15 units, and that across an orifice is 60 units, this device, known as the Dall tube, produces a head loss of only 6 units, it is claimed. Achieving a low head loss has not been done at the expense of accuracy, for the discharge coefficient is said to be stable and constant over its whole range.

Made of cast iron or steel with a liner of brass or gunmetal, the Dall tube consists of a short length of lead-in straight pipe followed by two cones spaced apart at the throat, allowing a small gap. The larger ends of both cones are appreciably smaller than the pipe bore. The upstream pressure tap is located just ahead of the larger end of the approach cone, while the throat tap is located within the chamber formed by the cone walls, in line with the gap between them.

Another advantage of the Dall tube is its compactness and light weight. It is about 1½ pipe diameters long, much shorter than a venturi tube. It may be installed at any angle. An upstream straight length of at least ten pipe diameters is required, but no straight length of pipe is required downstream.—*George Kent Ltd.*



Arctangent Graph Paper
Reaches to Infinity

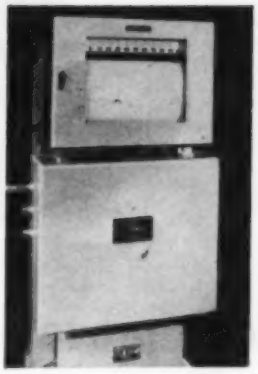
(180C) You can now plot complete curves of functions which approach infinity, using a special arctangent graph paper known as Arktan. Typical applications are the plotting of heating and cooling curves, reactance functions, and radioactive decay curves. You can extrapolate to zero or infinity with ease.

Arktan graph paper scales are based upon the equation

$$M = \frac{2}{\pi} M_{max} \arctan \frac{N}{120\pi}$$

M is the linear distance along the scale, measured from zero, M_{max} is the length of the scale, measured from zero. N is the scale reading representing values of the plotted data.

In the equation of the scale the modulus, 120π, was assigned a value of 377.002 in order to obtain a distribution of N on the scale suitable for the widest variety of ranges of data. The value of the modulus can be changed readily for the clearest presentation of a particular set of data by multiplying the original scale markings, N, by a suitable normalizing factor.—*Orbit Electric Co.*



Continuous Infrared Analyzer
For Process Control

(180D) Infrared absorption is the operating principle of this continuous analyzer, now completely redesigned for plant process control applications under adverse conditions. The new model is more compact and rugged and is designed to permit easy accessibility for servicing. Increased stability and accuracy over long periods, improved sensitivity, and higher resistance to shock and adverse temperature conditions are also claimed.

Two explosion-proof models are made. One is a composite assembly of voltage regulator, detecting unit, and recorder. The other is a remote control unit—the detector may be placed as far as 600 ft. from the recorder.

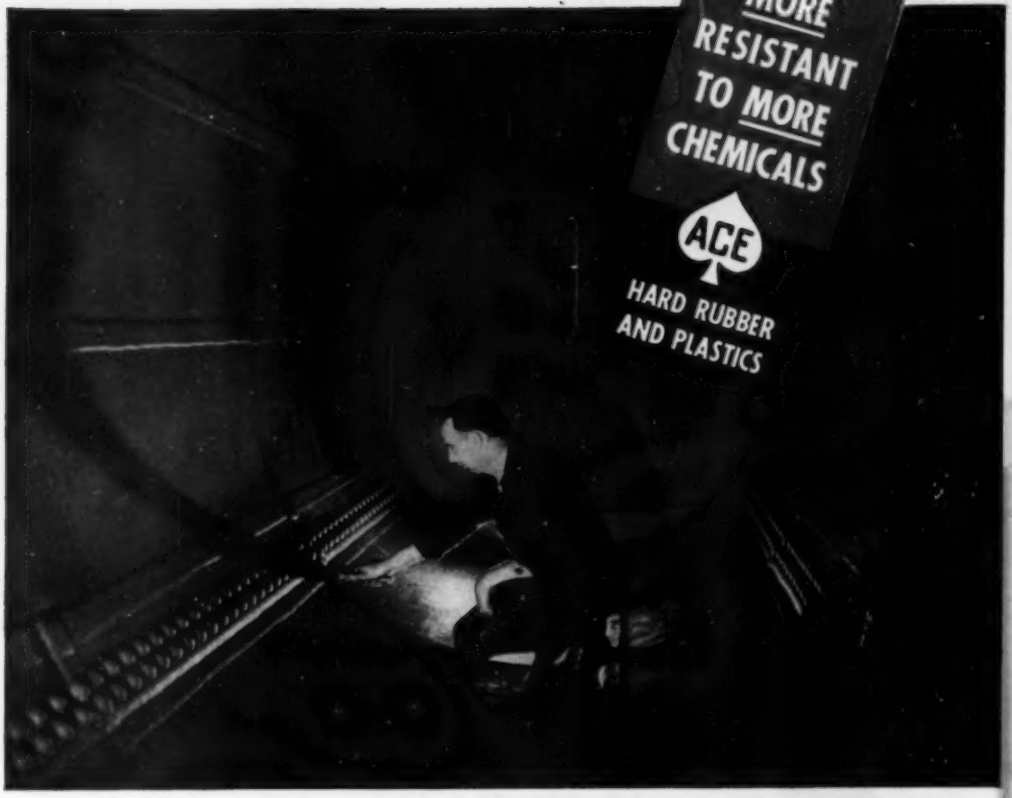
The instrument provides a continuous quantitative analysis for a single infrared-absorbing component in a stream of gases. Sensitivity depends on the gas to be detected as well as the presence of other absorbing gases in the mixture. Typical problems to which the analyzer can be applied are acetone, carbon monoxide, and SO_2 in air, ethylene in ethane and methane, and isobutane in normal butane.—*Baird Associates, Inc.*

Instrumentation Briefs

Ultrasound Intensity Meter—Indicates transmitted ultrasonic power on a scale calibrated directly in watts. Can be used under water. Range: 0 to 60 w. Radiological Corp. of America. *(180E)*

Remote Dynamometer—Device for remote measurement of tension, weight, or tractive loads is now equipped with oversize selsyn motors for added torque and increased dependability. W. C. Dillon & Co. *(180F)*

(Continued)



SIX MILLION GALLONS OF ACID

will ride the rails—in this ACE rubber-lined tank

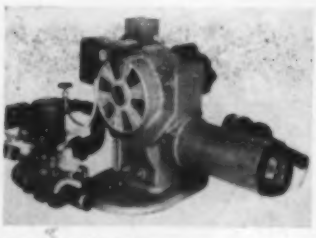
DOWN inside a tank car, this ACE rubber craftsman is "checking out" a lining that will deliver and store more than six million gallons of acid without failure over many years. Note the wide, straight seams. Note how each rivet head is meticulously covered. Note, too, the things you *can't* see—the clean sand-blasted steel, the special compound of quality ACE rubber—the careful cutting, filleting, fitting and cementing—the things that make the metal-to-rubber bond so strong it can't blister or peel.

In all types of chemical equipment, ACE hard rubber linings and coverings are available to resist all alkalies, metallic salts, inorganic acids, hydrochloric acid any strength, sulphuric acid to 50° Bé, nitric acid to 16° Bé, phosphoric acid to 75%, and countless other corrosives. Other ACE plastics extend this range still further. *Ask for catalogs.*

100th ANNIVERSARY

AMERICAN HARD RUBBER COMPANY

11 MERCER ST. · NEW YORK 13, N. Y.



Combination Burner Uses Either Oil or Gas

(182A) A new line of combination oil and gas burners makes it practical to use gas for industrial purposes even when it is available only on an interruptable or curtailable basis. The new burners include a forced draft system which provides with a single fan all air for combustion, assuring good control under varying atmospheric conditions.

Models in the new line range from capacities, expressed in terms of gas burning, of 720,000 Btu. to 8,700,000 Btu. per hr.—*Cleaver-Brooks Co.*

Lacquer Heater For Hot Spraying

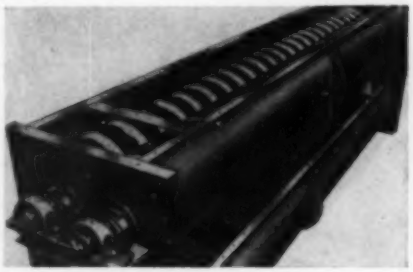
(182B) The Viscolator is designed to make possible the spraying of high solids content lacquers at 160 to 180 deg. F. Units from 8 to 40 gph. output are electrically heated; steam heating is available on units up to 250 gph. Heating elements and material-carrying tubes are embedded in solid metal for fast heat transfer. The tubes are said to be easily cleaned without dismantling the unit.—*Reliable Products Mfg. Co.*

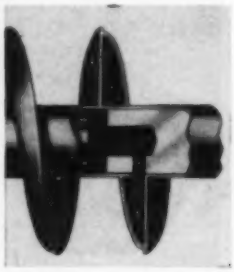
Insulating Cements Provide Finish Coat Also

Two new insulating cements are claimed by their producers to provide in one coat a finish which both insulates and protects.

(182C) One-Cote is recommended for temperatures up to 1,000 deg. F. It is said to be quick-setting, non-softening when exposed to rain or moisture after it sets, and rust-inhibitive. Based on mineral wool, its thermal conductivity at 200 deg. F. mean temperature is 0.50. It is packed in 50-lb. bags.—*Eagle-Picher Co.*

(182D) Powerhouse cement is also based on mineral wool. It can be used for temperatures up to 1,700 deg. F. Thermal conductivity at 200 deg. is 0.60, at 700 deg. is 1.0. With low shrinkage, it will set initially in less than 15 min., it is claimed, and hydraulic set occurs in less than 2 hr.—*Baldwin-Hill Co.*





Hollow Screw Heats or Cools

Unit for continuous processing of pastes and solids provides rapid heat transfer, occupies minimum space.

(182E) A new device for heating or cooling pastes, sludges, and solids consists of two or more hollow intermeshing conveyor screws rotating slowly in a trough or tube. A heat-transfer agent circulates through the hollow flights and shafts of the screws while the material being processed moves slowly along in the trough. The constant mixing, turning, and folding action given the material by the rotating flights assures a continual wiping of fresh material against the heat-transfer surface. As a result, rate of heating or cooling is high.

Known as the Holo-Flite, the basic unit consists of two intermeshing screws in a single trough. You can get four or six screws per trough if desired. Available screw diameters run from 7 in. to 16 in. Troughs are supplied in lengths from 8 ft. to 20 ft.; moreover, any number of troughs can be tiered vertically to provide whatever length of path is necessary in the space available.

Because of Holo-Flite's large surface area in relation to volume and its high rate of heat transfer, it requires much less space than conventional equipment for the same duty, according to the manufacturer. Up to 80 percent saving in space is claimed.

The screws rotate very slowly—usually only 1 to 12 rpm. Action is so gentle that there is no dusting and very little abrasion of crystalline particles. Power consumption is small; in addition, tiered units can be driven by a single motor.

Existing Holo-Flite installations are handling such materials as sand, cement, cottonseed cake, soybean meal, borax, salt, sugar, and baby foods. Some of these installations are used for cooling, others for cooking. Cooled products can be packaged directly from the Holo-Flite discharge.—*Western Precipitation Corp.*

Heating & Cooling Briefs

Portable Oven—Operates on 110 v., good for 100-800 deg. F. Has thermostat, outside reading thermometer, pilot light. Grieve-Hendry Co. *(182F)*

Unit Coolers—Seven new models using ammonia and seven similar models using Freon. For ice cream plants, frozen food storages, meat packing plants. York Corp. *(182G)*

Condensate Return Unit—Handles water to 210 deg. F. without vapor lock. Mounted vertically, good for applications up to 8,000 sq. ft. EDR at 20 psi. Roy E. Roth Co. *(182H)*

(Continued)

LIGHTNIN SERIES "E" heavy-duty turbine agitator. Made in sizes from 1 to 500 HP. Quickly convertible for open-tank or closed-tank operation. Operates at any one of 16 standard AGMA speeds. Speed is quickly changed without removing unit from tank. Described in Catalog B-36.

Lightnin® Mixers

MIXCO® Engineered

For Fluid Agitation

that does what you want it to do

Flexibility—the kind that saves you money and helps you get good processing results—is built into Lightnin Mixers.

One example of this is the Lightnin impeller. Sizes and shapes are standard—with *known* flow pattern and power response.

As blades are added, the power requirement increases, stepwise, in a *known* quantity.

This means that Mixco engineers can *accurately predict* what your process results will be. It also permits accurate *sizing* of the mixer—big enough to do the job without overloading, small enough to keep your horsepower requirements at a minimum.

The impellers on Lightnin Mixers are made of standard, interchangeable parts. Blades can be added, changed, replaced without going to the expense of a new impeller. This cuts upkeep and gives you *flexibility* to meet future changes in process requirements.

To get the whole story of how Mixco engineers and Lightnin Mixers can give you fluid agitation that's *guaranteed* to do what you want it to do, write today.

MIXING EQUIPMENT Co., Inc.
(MIXCO)
128 Mt. Read Blvd., Rochester 11, N. Y.
In Canada: William & J. G. Greey, Ltd., Toronto

Please send me the literature checked:

- ☐ B-76 Side Entering Mixers
- ☐ B-78 Top Entering Mixers (Propeller Type)
- ☐ B-89 Top Entering Mixers (Turbine and Paddle Type)
- ☐ DH-50 Laboratory Mixers
- ☐ B-100 Condensed Catalog showing complete line
- ☐ B-75 Portable Mixers (Electric and Air Driven)

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____

LIGHTNIN PORTABLE MIXERS
World's largest-selling line. Electric or air motor, direct or gear drive. Sizes ¼ to 3 HP.

LIGHTNIN SIDE ENTERING MIXERS
For tanks up to 5 million gallons. Gear motor or V-belt drive; motorless types. Sizes 1 to 25 HP.

LIGHTNIN TOP ENTERING AGITATORS
Turbine, propeller and paddle types. For open or closed tanks. 16 speeds available in new heavy duty drive. Sizes ¼ to 500 HP.

A COMPLETE LINE . . . UNEXCELLED TECHNOLOGY

All-Plastic Fume Ducts Of Homogeneous Composition

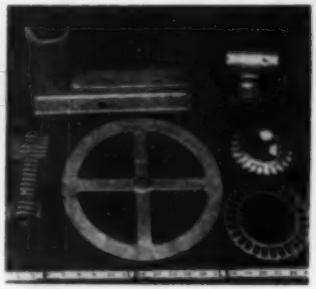
(184A) Corrosion-resistant fume hoods, ducts, and waste disposal flumes can now be made completely of a single synthetic composition, even down to the fastenings. This new development is made possible by the remarkable combination of mechanical properties of Uscolite, a blend of butadiene-styrene plastic with butadiene-acrylonitrile rubber.

Uscolite can be calendered in sheet form for the large flat surfaces needed. Curved surfaces can be formed by hot bending and deep drawing. Corner channels, reinforcing strips, and flanges are made by extrusion. Uscolite nuts, bolts, and rivets are formed by injection molding. Special small parts can be made by machining and cutting. Joints are solvent-welded with Uscolite cement.

The all-plastic construction makes hoods and ducts of Uscolite resistant to corrosive attack not only on the inside surfaces but throughout. Uscolite ducts may be used in almost any corrosive atmosphere found in chemical plants. Piping made of this same material is already widely used.

Uscolite is reported to have excellent resistance to such materials as hydrochloric acid, sulphuric acid (50 percent maximum), ferric chloride, caustic soda, chlorine, and food acids. Resistance is fair when exposed to aliphatic solvents, nitric acid (10 to 25 percent), chromic acid (10 percent maximum), and acetic acid (10 percent maximum). It is not recommended for aromatic solvents, chlorinated solvents, ketones, esters, nitric acid over 25 percent, or chromic and acetic acids over 10 percent. Moisture absorption is very low.

Other desirable mechanical properties add to Uscolite's usefulness as a structural material. Its high impact strength is achieved without sacrificing rigidity. Even though it is so tough that you can't break it with a hammer blow, it is rigid enough for installation with only a minimum of support. Hoods and ducts are made of sheet only ¼-in. thick.—*U. S. Rubber Co.*



Aluminum Casting Alloy For High Temperatures

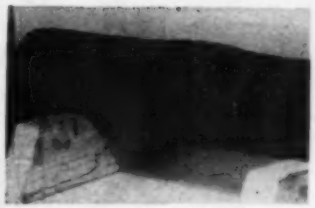
(184B) A new light metal casting material, ML aluminum alloy, has been developed by the Air Force for use at elevated temperatures. The need for such a material has been emphasized in the design of modern aircraft. Casings, supports, and many other parts which formerly operated at 200 to 300 deg. F. are now being designed for as high as 600 deg. F.

Nominal composition of the new alloy is as follows:

Copper	4 percent
Nickel	2 "
Magnesium	2 "
Manganese	0.3 "
Chromium	0.3 "
Vanadium	0.05 "
Titanium	0.1 "
Aluminum	Balance

Typical as-cast tensile strength at room temperature is 33,000 psi., with a yield strength of 31,000 psi. and elongation of 1.2 percent in 2 in. The 400-deg. F. properties are 29,000 psi. ultimate tensile strength, 27,400 yield strength, and 1.5 percent elongation in 2 in. The 600-deg. F. properties are 16,900 psi., 14,500 psi., and 9 percent.

Melting practice varies slightly from the normal when making castings. In order to obtain the desired microstructure and consequent properties, it is necessary to hold the metal after melting at 1,500 deg. F. for 30 min. prior to chlorination or other degassing treatments. Best pouring temperature range is 1,325 to 1,375 deg. F. Examples of castings are shown in the illustration. — *Materials Laboratory, Wright Air Development Center.*



Acidproof Joint For Resin-Base Piping

(184C) The Duro-Joint, a new wrapped joint for Haveg and other resin-base pipe, can be made in the field without the use of heat or special equipment. It is composed of a spiral wrapping of glass cloth and Lecite furan resin cement. Making use of a special technique, the joint is said to be equal in strength and chemical resistance to the pipe itself. This development will obviate the use of flanges, which are subject to corrosion, and will even permit the field repair of broken pipe.

Duro-Joints have been tested without failure under hydrostatic pressures pulsating rapidly between zero and 350 psi. They have been placed under 100 psi. steam pressure and, after release of pressure but while still hot, immersed in water at 60 deg. F. with apparently no effect.—*Electro Chemical Engineering & Mfg. Co.*

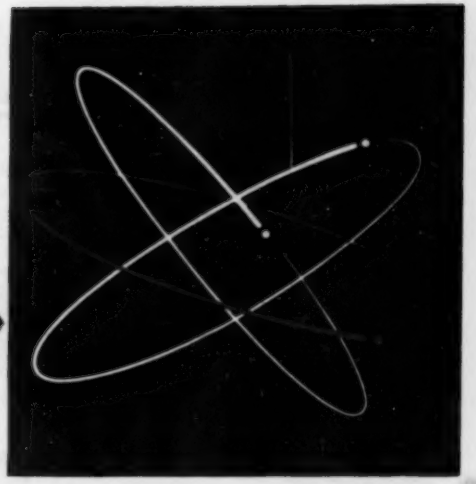
Ceramic-Coated Steel Replaces Scarce Alloys

(184D) Scarce strategic alloys can be conserved by replacing them with ceramic-coated steel parts. This substitution has become a pronounced trend in the aircraft industry. Ceramic-coated exhaust assemblies are being installed on engines for B-50 bombers, C-97 Stratofreighters, and Convair Model 240 and Model 340 transports. In the jet engine field, General Electric is trying ceramic coating of the transition liners and inner combustion chambers for the J-47 engine. Experimental work is also being conducted on ceramic coating of DC-6 exhaust stack assemblies through service tests on actual scheduled runs. On the ground, the 825-hp. engine for the General Patton tank will have ceramic-coated sections on its manifold.

The coating is only 0.001 to 0.003 in. thick and adds little to the weight of the part. Life of hot parts is increased by thus improving their resistance to heat and gas erosion.—*Ryan Aeronautical Co.*

(Continued)

first *all-electronic control*



of pressure

temperature

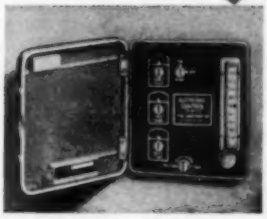
flow

and level ...

The new Swartwout Autronic Control System is the first miniature all-electronic control system for process and power instrumentation. Completely revolutionary in conception, it is the ultimate in centralized control no matter how stringent your requirements for accuracy, speed, reliability and compactness.

Because transmission of information throughout the Autronic Control System is by electrical means *only*, there is no transmission lag; control of final element is accurate, positive and *instantaneous*. Right from the primary measuring element to the final element there is no mechanical motion whatsoever . . . no slide wires to initiate control action . . . no booster mechanisms or other delicate equipment to overcome distance effects . . . no trouble caused by air leaks or frozen air lines.

Call in our engineering representative to explain how the Swartwout Autronic Control System can bring new accuracy and speed to *your* process instrumentation and control. Or write *today* for literature on the new Swartwout Autronic Control System.



Swartwout *Autronic* CONTROL SYSTEM

THE SWARTWOUT COMPANY • 18511 EUCLID AVENUE • CLEVELAND 12, OHIO

NEW SAFETY EQUIPMENT

Safety Signs With Special Messages

(186A) A new line of safety signs includes, in addition to the usual danger and caution signs, safety first signs with special warning messages and directional signs to eliminate confusion. Made of heavy gage steel with flexible baked enamel finish, these signs are lettered strictly in accord with recommendations of the U. S. Department of Commerce and are made in compliance with official American Standards Association specifications.—*Eastern Metals of Elmira.*

Plastic-Coated Gloves Are Worn on Either Hand

(186B) Ambidexterity is the latest wrinkle in protective clothing. A new plastic-coated glove, featuring a free-swing thumb, can be worn on either hand. If your wife buys her nylons two matching pairs at a time, you can appreciate the economics involved.

These gloves have a soft, fleecy, comfortable lining. The plastic coating is acid-resistant, grease-proof, and non-flammable. A non-slip finish helps the wearer to grasp slick objects. The gloves are easily laundered.—*Washington Glove Corp.*

Safety Goggle Pliers Make Repairs Easy

(186C) Two new safety goggle pliers simplify and speed up the replacing of side-shields on spectacle-type safety goggles. The pliers, called the 169 rivet knock-out plier and the 170 riveting plier, permit you to insert or remove goggle rivets without removing lenses, and in just a few seconds of time.—*American Optical Co.*

Portable Fire Extinguisher For One-Hand Operation

(186D) The new Redi-Grip pressurized portable fire extinguisher may be released from its bracket and operated with one hand. Its range exceeds 30 ft., and discharge time of the 1-qt. size is about 27 sec. at 70 deg. F. It is made in 1, 2½, and 4-qt. sizes and features a combination of charges—chlorobromomethane or carbon tetrachloride, individually or in combination. The expellent may be either air or carbon dioxide.—*Stop-Fire, Inc.*

Non-Skid Canvas Sandals Reduce Slipping Hazard

(186E) Non-skid canvas sandals, called Slogs, have recently been developed to reduce the danger of workmen slipping on wet floors, inside tanks, or any other wet, smooth surface. Slogs are made of three layers of heavy special cotton duck and are reinforced at all critical points of strain. Being completely reversible, they can be turned inside out when one side becomes worn.

Slogs are worn over boots or shoes, thereby cutting down wear on the regular footgear. They cost about $4 per pair.—*Bellerose Products Co.*

Gas Mask Canister For Ammonia Fumes

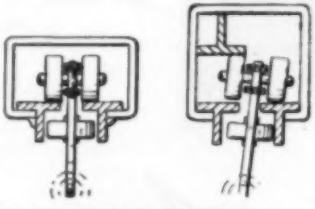
(186F) A new and superior adsorbent replaces the silica gel formerly used with MSA ammonia masks. Canister life is said to be doubled. The mask is equipped with an all-vision face-piece to provide greater visibility while allowing complete eye protection.—*Mine Safety Appliances Co.*

NEW PACKAGING & HANDLING EQUIPMENT

Stainless Steel Drum Carried Easily and Safely

(186G) The new Hackney 15-gal. stainless steel drum offers important features to those who ship and store acids, foods and other corrosive liquids. Rugged, full-curled foot ring construction provides easy and safe handling. Bottom foot ring fits snugly and securely over the top ring of the barrel beneath, permitting stable stacking.

The new drum is offered in various types of stainless steel, with specific type matching the intended service.—*Pressed Steel Tank Co.*

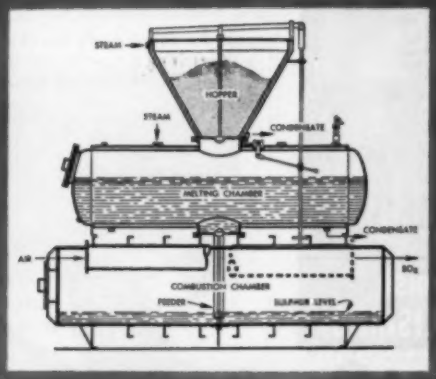


Overhead Chain Conveyor Runs on Three Wheels

(186H) A new overhead chain conveyor, known as the Econ-O-Veyor, uses trolleys which have three ball-bearing wheels, two positioned vertically and the third positioned horizontally. The conveyor track consists of two parallel T bars. A vertical wheel of each trolley is carried on each T bar and the horizontal wheel runs between them. On turns, a third T bar is placed above the outside T bar.

The horizontal wheel maintains contact with the inside bar on turns so as to give the chain and trolleys full rolling contact with the track at all times without the aid of roller or traction wheel turns. The chain pull is in line with the vertical wheels so that the chain does not have a tendency to rock the trolleys. This is claimed to

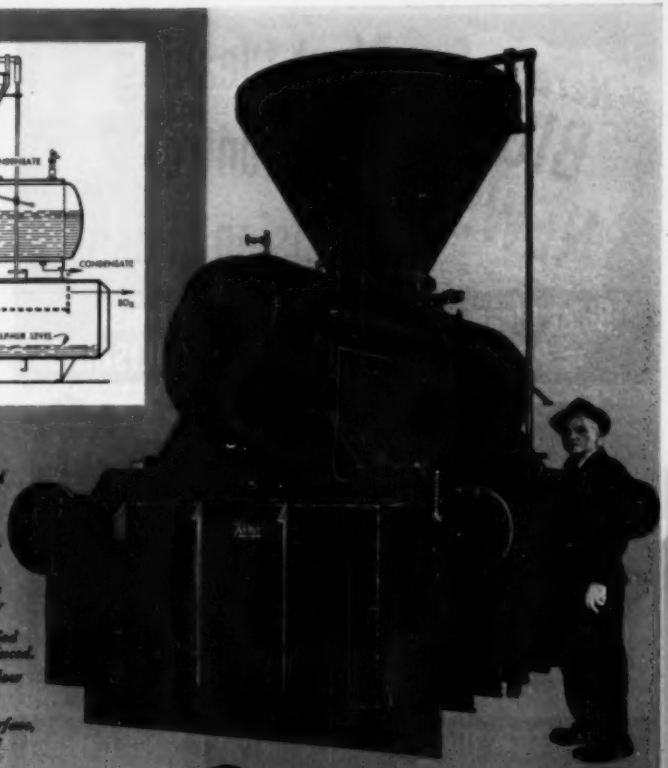
(*Continued*)



OPERATING PROCEDURE

Solid sulphur is charged into the hopper of the melting chamber, around which live steam is introduced at about 25 pounds gauge pressure (if steam is not available, an electric heating element is supplied). The melted sulphur is fed to the combustion chamber by means of the feeder, which automatically maintains the correct level. Compressed air, or air furnished by a blower, is used for combustion. The quantity of air supplied regulates the concentration of SO_2 produced.

Since the introduction of the feed is below the surface, the burning area is never disturbed. This, together with the unchanging level of molten burning surface, and a controlled air supply, guarantees a constant burning rate and thereby a uniform production of SO_2.



ONLY ACME *Sulphur Burners* PROVIDE

ALL THREE BASIC REQUIREMENTS

1. CONTROLLED, UNIFORM PRODUCTION OF SO_2
2. COMPLETE COMBUSTION
3. CONTINUOUS OPERATION

An ordinary sulphur burner, which burns solid sulphur on a tray or rotating cylindrical surface, cannot provide a definite, constant burning rate. Since ordinary sulphur contains a small percentage of organic matter, this matter accumulates as a carbonaceous scum on the surface of the burning sulphur, and gradually extinguishes the fire. In order to overcome this factor the Acme Sulphur Burner is operated at a controlled rate sufficient to burn off this scum.

In an ordinary burner, the addition of a fresh charge of sulphur to the burning surface disrupts the burning rate for several hours. The Acme Sulphur Burner has a special feeding device that feeds melted sulphur to the burner in a manner that does not disturb the burning surface, at the same time maintaining a constant level of burning sulphur. Thus, uniform production, complete combustion, and continuous operation result. Operation is possible under pressure or vacuum.

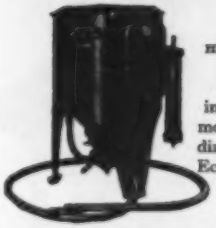
DATA & DETAILED DESCRIPTION ON REQUEST

ACME Processing Equipment

ACME COPPERSMITHING & MACHINE CO. ORELAND, PA

Here's BIG NEWS on Blast Cleaning Dust Control Precision Finishing

Blast Cleaning Unit is PORTABLE!



Ideal for maintenance and many other jobs, including removal of rust, dirt, scale, etc. Economically cleans large objects like tanks, bridges, structural work before painting. Six sizes, stationary or portable, from..... $170.00 and up

Hydro-Finish SPEEDS POLISHING!

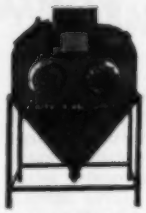
Removes scale, and directional grinding lines . . . prepares surfaces for plating and holds tolerances to .0001"! Liquid blast reduces costly hand cleaning and finishing of molds, dies, tools, etc. Models from $1295.00 and up

STOP DUST at the SOURCE!

Pangborn industrial type Unit Dust Collectors trap dust at source. Machine wear is minimized, housekeeping and maintenance costs reduced. Solves many grinding and polishing nuisances and material losses. Models from $286.00 and up

COMPACT Blast Cabinet for SMALL WORK!

Ideal for producing smooth, clean surfaces on pieces up to 60" x 36" in size. Cleans metal parts, removes rust, scale, grime, dirt, paint, etc., in a few seconds. Saves money all year 'round. Models from $315.00 up



Look to Pangborn for the latest developments in Blast Cleaning and Dust Control Equipment

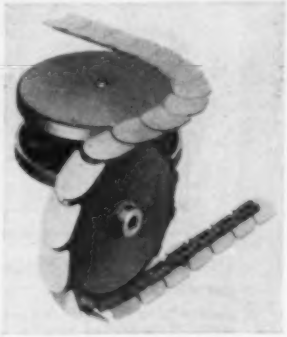
Pangborn MAIL COUPON FOR DETAILS

Check for more information
- ☐ Blast Cleaning Cabinets
- ☐ Blast Cleaning Machines
- ☐ Unit Dust Collectors
- ☐ Hydro-Finish Cabinets

PANGBORN CORP., 2400 Pangborn Blvd., Hagerstown, Md.
Gentlemen: Please send me more information on the equipment I've checked at the left.

Name.....
Company.....
Address.....
City.....Zone....State.....

make for an extremely low chain pull, with resulting low power consumption and long life.—*Shuler Conveyors, Inc.*



Flat Top Conveyor Chain Flexes in Two Planes

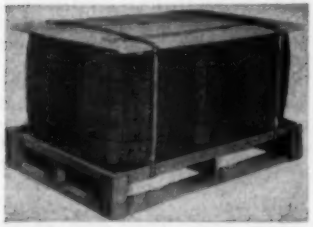
(188A) A new flat top conveyor chain, known as the Rex Flextop, flexes in both horizontal and vertical planes. It consists of carbon steel or stainless steel crescent-shaped top plates mounted on links which are connected by a specially designed universal joint. It will curve around corners with a radius of as little as 6 in.

Designed primarily for conveying bottles, jars, packages, or small parts, a Flextop conveyor can be driven from one power source, eliminating the need for transmission parts at transfer points. The speed at which the chain can be run is determined by the

LITHOGRAPHED DRUMS

(188B) Celanese has become the first chemical manufacturer to adopt a recently developed process for lithographing steel drums. The Rheemcote process permits users to identify their products in drums with familiar, colorful trade-marks, reproduced in fine detail. Flat steel sheets are fed to a lithographing press, then fabricated into 55-gal. drums. —Rheem Mfg. Co.

product being handled and by the length of the conveyor.—*Chain Belt Co.*



Keg Pallet and Cover Handles Six at a Time

(189A) The recently developed keg pallet and cover shown above enable you to handle six standard kegs at a time with a fork lift truck. The 42x28-in. deck of the pallet is recessed slightly to prevent kegs from rolling off while the unit is being moved. For protection of keg contents and to provide additional stability in stacking, the cover is attached with steel bands. Made of heavy gage steel and welded throughout, this unit permits stacking to a height impossible with unpalleted kegs.—*Phillips Mine & Mill Supply Co.*

Conveyor Belt Cleaner Mounts Under Return Run

(189B) You can now keep your conveyor belts clean with a device consisting of a set of self-aligning spring steel wiper blades, set perpendicular to the belt surface, but diagonal to belt travel. These blades are designed to wipe the belt clean and dry as it passes. The unit is mounted under the return run of the belt.—*Stephens-Adamson Mfg. Co.*

Packaging & Handling Briefs

Electric Trucks—Four new high-lift Power Ox trucks. Capacities of 2,000 and 4,000 lb., lifting heights to 121¼ in. Barrett-Cravens Co. *(189C)*

Canned Bearings—Manufacturer is experimenting to find a way to prevent deterioration of bearings under adverse storage conditions. Timken Roller Bearing Co. *(189D)*

Flow Diverter—Connects at any point on a permanent gravity roller conveyor line to divert cartons to temporary spur lines. Rapid-Standard Co. *(189E)*

Electric Pallet Truck—SpaceMaker Low-Lift, now permits operator to ride. Lyon-Raymond Corp. *(189F)*

In One Year

PANGBORN DUST CONTROL

SAVES $15,000

for MIDDLESEX SILVER CO.

(division of R. Wallace & Sons Co.)

Heart of profitable dust control at Middlesex Silver is a Pangborn CJ Collector like this. Shown above in a cutaway view are the filters which make the CJ ideal for heavy loading applications like this.

Pangborn Dust Control recovers valuable silver from plant dust!

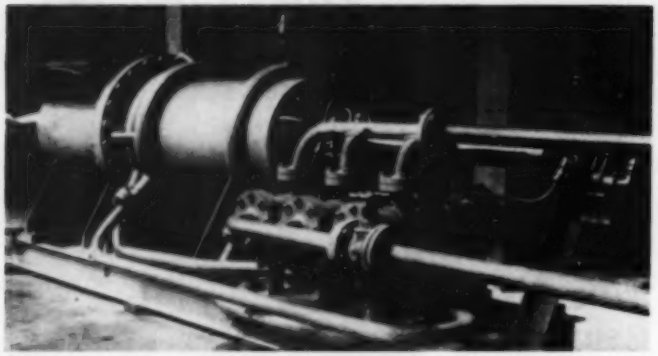
Talk about profit! Every year Pangborn Dust Control at Middlesex Silver earns a profit of $15,000 after *all operating expenses* are paid! Centrifugal collectors are used to trap coarse dust particles . . . and *high efficiency is assured* because valuable silver fines are recovered by the big Pangborn CJ cloth screen Collector. Result to Middlesex: Pangborn Dust Control has more than paid for itself since installed!

Pangborn has a complete line of Dust Collectors, each designed for a specific job. No matter if the dust in your plant is *valuable, hazardous, or just a nuisance* . . . chances are Pangborn Dust Control will *save you money.* Find out . . . there's no obligation. For full information, write today for Bulletin 909A to PANGBORN CORPORATION, 2600 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the Latest Developments in Dust Control and Blast Cleaning Equipment

Pangborn DUST CONTROL

STOPS THE DUST HOG from stealing profits



AUTOMATIC VALVE GEAR in foreground continuously controls the operating sequence of cutting cylinder and pistons.

LOADING the hopper of the Meader pump with lime sludge.

DISCHARGE end of the line. Note consistency of the material pumped.

Pump or Extruder?

This ingenious new device enables you to push thick sludges and pastes through long pipelines.

(190A) Successful development of a new pump, known as the Meader pump, will provide chemical engineers with an economical means for transporting thick sludges and semi-solids. The new pump handles many materials which heretofore have been regarded as unpumpable.

This device consists of a chute or hopper, a cutting cylinder, and a ram assembly. The pumping cycle consists of three strokes: First, the cutting cylinder is filled with the material to be pumped by forcing it with hydraulic pressure horizontally through the sludge in the bottom of the hopper. In the second stroke the sludge is expelled from the cutting cylinder into the discharge line. This is done by a close-fitting piston forced also by hydraulic pressure along the inside bore of the cutting cylinder. The final stroke is the simultaneous return of cutting cylinder and pistons to their original positions.

The original objective when designing this pump was to handle a thick, clayey residue with a moisture content of only 36 to 38 percent. After several attempts at using other types of pumps, it was realized that they did not provide an inlet opening sufficiently large to permit the passage of thick sludges. The new pump provides an inlet of maximum size, equivalent to the projected horizontal area of the cutting cylinder itself. Inasmuch as the discharge valve permits flow in only one direction, withdrawal of the cutting cylinder from the base of the hopper creates a partial vacuum. Atmospheric pressure then assists gravity in filling the vacant space with the next slug to be pumped.

The pistons are actuated by water pressure from a multi-stage centrifugal pump. The material in the illustrations was pumped through 200 ft. of 5-in. pipe containing five 90-deg. short bends with a power supply of 100-psi. water from a 15-hp. three-stage centrifugal pump. Power could also be supplied by steam or compressed air or by direct mechanical drive.

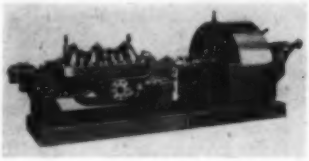
Maintenance costs for the new pumps should be very low. All moving parts operate fairly slowly, and there is a complete absence of external glands.

The range of capacities under consideration at present is 5 to 100 ton per hr. Potential applications are the pumping of sewage sludges, filter cakes, unset concrete, thickener underflow, or paper pulp.—*Henry Balfour & Co.*

Centrifugal Pumps For General Purpose Use

(190B) A new line of general purpose centrifugal pumps features light weight and easy handling, installation, and mounting. Two sizes are currently available—2-in. suction by 1¼-in. discharge and 1½ in. by ¾ in. Operating at 3,450 rpm., these pumps deliver up to 100 gpm. at heads to 120 ft.

Standard pumps are bronze fitted, with casing and motor stand of close-grained cast iron. Impellers and wearing rings are of hard bronze. The pumps are of the close-coupled type and are equipped with mechanical seals. Standard mounting is vertical; with the addition of motor feet, however, the pumps can be adapted for horizontal mounting.—*Economy Pumps, Inc.*



Opposed Impeller Pump Designed for Balance

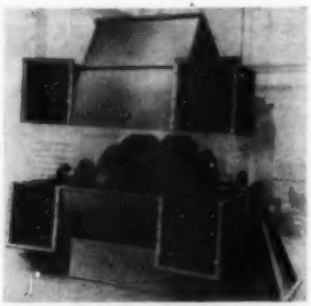
(190C) A new line of multi-stage opposed impeller pumps is designed for services up to 1,000 gpm. and 1,200 psi. at temperatures to 400 deg. F. These pumps are made in

four-, six- and eight-stage models. They are constructed with impellers mounted back to back to balance axial thrust and with volutes staggered 180 deg. to balance radial thrust.—*De Laval Steam Turbine Co.*

Reciprocating Pumps Have 3 to 9 Plungers

(191A) A new series of 6-in. stroke direct flow reciprocating pumps includes, in addition to the customary triplex model, units having five, seven, and nine plungers. All wearing parts are interchangeable among the several different multiplex models.

Plunger diameters run from 2 to 5¼ in. At the maximum speed of 300 rpm., volumetric deliveries range from 75 to 500 gpm. for a three-plunger pump and 220 to 1,500 gpm. for a nine-plunger pump. Power consumptions are in the range of 300 to 900 bhp.—*Aldrich Pump Co.*



Forced Draft Fan With Improved Features

(191B) Three improved features contribute to higher efficiency of a new forced draft fan. Large, deep inlet cones, streamlined to reduce turbulence; open space between the wheels of double-wheel models, instead of a common center disk, permitting complete four-way diffusion of air leaving the wheels; and an oversize housing to assist diffusion—all are said to provide a more complete conversion of velocity head to static pressure.—*Prat-Daniel Corp.*

(Continued)

Teamed Up Against Impurities

...The High Adsorptive Capacity and Premium Purity of DARCO G-60

IN BOTH plant and laboratory, these outstanding characteristics of Darco G-60 activated carbon work together to help you attain your goal—ridding solutions of unwanted colors, odors, tastes, colloids, and like impurities.

The high adsorptive capacity of Darco G-60 means that minimum doses give maximum results in the purification of valuable solutions.

Premium purity means that Darco G-60 is free of extractable contaminants and low in iron and other metals that can cause so much trouble in the processing of fine chemicals and pharmaceuticals. Darco G-60 will not impart color or other impurities to the solution being treated.

High adsorptive capacity and *premium* purity are only two of the reasons Darco G-60 is specified by both research chemists and plant superintendents. Write for complete information and a sample of this outstanding activated carbon.

DARCO G-60
by the gram or the carload

DARCO

DARCO DEPARTMENT
ATLAS POWDER COMPANY
Darco General Sales Offices
60 East 42nd Street, New York 17, N. Y.

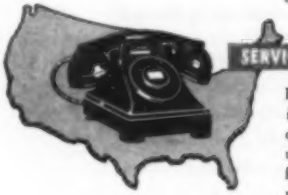
MODERN ENGINEERING demands precise standards of heat insulation performance. Pabco's *Precision Molded* 85% Magnesia combines the time-tested superiority of Magnesia with precision molding to give you a light weight insulation manufactured to very close tolerances.

LOCAL STOCKS

Pabco Engineering Service Units are strategically located throughout the United States and maintain adequate stocks of Pabco's *Precision Molded* 85% Magnesia Heat Insulation. Regardless of your location, Pabco Engineering Units give the service and materials you need when you need them.

COMPETENT INSULATION ENGINEERS

Each Pabco Approved Engineering Service Unit is staffed with competent insulation engineers and skilled mechanics. Between each unit and the Pabco factory there is a constant cooperative interchange of experience and methods, resulting in special benefits to every customer.



SERVICE EVERYWHERE

Pabco Engineering Service Units may be found in the classified section of the telephone book, or by writing to the factory. You can depend upon every Pabco Engineering Service Unit for the same high standards of materials, workmanship and methods of application. Get the complete facts on Pabco heat insulation and service now for your future needs.

THE DEPENDABLE STANDARD — "MODERNIZED"

quality

PABCO PRODUCTS INC.

Insulation Division

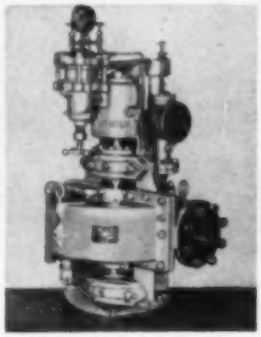
San Francisco 19 New York 16

Manufacturers of Heat Insulation

Since 1920

Pabco Engineering Service Units in all Principal Cities

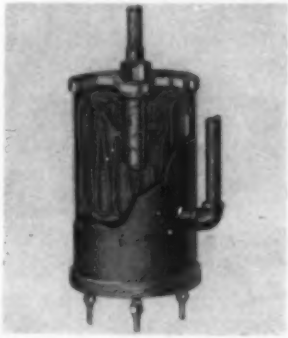
NEW ELECTRICAL & MECHANICAL EQUIPMENT



Vertical Turbine Develops up to 90 Bhp.

(192A) For driving vertical centrifugal pumps and similar units, here is a small, compact, vertical steam turbine which is capable of developing up to 90 bhp. This new turbine is available in either semi-steel or cast steel and can be used with a wide range of steam pressures and temperatures. The standard machine is designed for thrust loads in either direction up to approximately 1,500 lb.

Addition of this turbine extends the manufacturer's line to three different frames, offering vertical turbines for a wide range of horsepower and speed ranges.—*Whiton Machine Co.*



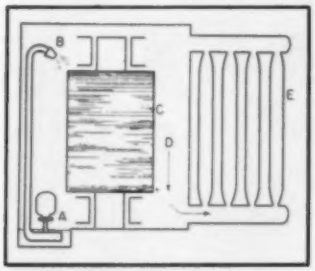
Air Cleaner and Dryer With Low Pressure Drop

(192B) The new Model B Condensifilter removes water, oil, sludge and other foreign matter from compressed air. It combines in a single unit a dehydrating device, a mechanical filter, and a self-purging trap. Measuring only 15 in. high by 9 in. in diameter, it has a capacity of 30 cfm. at 100 psi. Total pressure drop

across the unit is said to be less than 2 psi.

The condensing unit, designed to remove water in both entrained and vapor states, is composed of a series of water-cooled copper coils. In passing through this section the air is cooled to within 2 deg. of the cooling water temperature.

The filtering unit is made of five hexagonal filter chambers in parallel, each chamber wrapped with seven layers of canton flannel. Easily removed for cleaning, it offers more than 4 sq. ft. of filtering area. According to the manufacturer, it will remove particles as small as 1 micron.—*Hankison Corp.*



Vapor-Cooled Transformer Is Safer and Lighter

(193A) A vapor-cooled vapor-insulated transformer now under development is expected to be ½ to ¼ lighter than liquid-immersed units of equivalent rating and performance. The new transformer uses the heat of vaporization of a high-molecular-weight liquid fluorocarbon for cooling and the superior dielectric strength of the fluorocarbon vapor for insulating.

Here's how it works: A small pump (A) forces liquid fluorocarbon from sump to nozzle (B), where the liquid is sprayed uniformly over the core and coils (C). The liquid evaporates, cooling the coils. Fluorocarbon vapor fills the space in the tank (D), insulating the transformer parts. The vapor flows upward through the cooling tubes (E), and as it condenses the condensate flows by gravity back to the sump.

The fluorocarbon remains near its boiling point throughout the system. The temperature of the cooling surfaces is only a few degrees C. lower than that of the coils, the differential being much less than in conventional liquid-immersed units. Use of this principle makes it possible to design a more compact coil assembly and to reduce the external cooling surface.

Even though only a small amount of fluorocarbon is used in the trans-

(Continued)

PRODUCTS OF METHYLATION

IT'S *Easy* AND *Economical* TO METHYLATE WITH ANSUL METHYL CHLORIDE

You can save money by using ANSUL METHYL CHLORIDE in the methylation of amines, phenols, alcohols, hydrocarbons, etc. Based on CH_3-groups available for reaction, other methylating agents are considerably more expensive than Ansul Methyl Chloride.

Also Ansul Methyl Chloride can be conveniently weighed or metered for positive control of the methylation process. When methyl chloride is used for methylation, no pumps are necessary for transferring it. Methyl chloride, a liquefied gas, provides its own pressure and facilitates handling greatly.

If you have a product to be methylated and you do not have the capacity or the facilities to handle it, ANSUL WILL DO IT FOR YOU. Ample facilities for methylation are immediately available at the Ansul plant in Marinette, Wisconsin.

Write for your copy of Bulletin No. 1002 an Ansul Technical Staff publication.

If you wish specific information regarding methylation processes, products of methylation or products you wish methylated give particulars in your letter. Our Technical Staff will willingly cooperate with you.

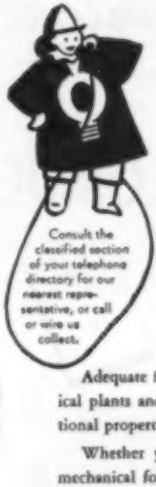
ANSUL METHYL CHLORIDE is available in TANK CARS, MULTI-UNIT CARS, DRUMS and CYLINDERS.

For your SULFUR DIOXIDE requirements use ANSUL SULFUR DIOXIDE.

ANSUL CHEMICAL COMPANY
INDUSTRIAL CHEMICALS DIVISION
MARINETTE • WISCONSIN
60 E. 42nd St., New York
Lincoln-Liberty Bldg.,
Broad & Chestnut St., Philadelphia 7, Pa.

ALSO MANUFACTURERS OF REFRIGERANTS • REFRIGERATION PRODUCTS • DRY CHEMICAL FIRE EXTINGUISHERS

"Automatic" Sprinkler Protection is tailored to the Fire Protection requirements of these chemical plants



Here listed are but a few of the top chemical processing businesses whose personnel, manufacturing operations and business continuity have been safeguarded from fire by "Automatic" Sprinkler:

Allied Chemical & Dye Corporation
Bakelite, Inc.
Barium Reduction Corporation
Buckeye Cotton Oil Company
Defender Photo Supply Company
Delta Products Company
General Tire & Rubber Company
Glidden Company
Goodyear Tire & Rubber Company
Harshaw Chemical Company
Hercules Powder Company
Interchemical Corporation
Lever Brothers Company, Inc.
Minnesota Mining & Mfg. Co.
Monsanto Chemical Company
Pathfinder Chemical Corporation
Pierce & Stevens, Inc.
Pittsburgh Plate Glass Company, Columbia Chemical Division
Procter & Gamble Company
R. B. H. Dispersions, Inc.
Reilly Tar & Chemical Corp.
Rohm & Haas
Schenectady Varnish Company
G. D. Searle Company
Southern Alkali Corporation
U. S. Industrial Chemicals, Inc.
Witco Chemical Company

Adequate fire protection is essential to the safe and economic operation of chemical plants and—the same is true of all types of industrial, commercial and institutional properties.

Whether your needs call for "Automatic" Sprinklers, CO_2 gas, chemical or mechanical foam, "Automatic" FIRE-FOG, or a combination system of protection, our preliminary engineering service now makes it possible to fairly evaluate the economic and adaptability features of each method, for your own risk.

Let our nearest representative show you how to save lives . . . save property and save money with fire protection by "Automatic" Sprinkler. *Literature available upon request.*

"AUTOMATIC" SPRINKLER CORPORATION OF AMERICA
YOUNGSTOWN 1, OHIO

"Automatic" Sprinkler
FOR INVESTMENT PROTECTION

DEVELOPMENT · ENGINEERING MANUFACTURE · INSTALLATION

OFFICES IN PRINCIPAL CITIES OF NORTH AND SOUTH AMERICA

former, its present high cost may result in a unit that actually costs more than a liquid-immersed type. The new transformer, therefore, will find greatest usefulness where a higher degree of safety is required than is obtainable from liquid-immersed transformers, where space and voltage requirements rule out dry transformers, and where extremely compact installations with forced external cooling or a remote cooler are required.—*Westinghouse Electric Corp.*

Copying Machine With 46-in. Printing Width

(194A) The new Model 20 Copyflex machine is designed for medium volume production of prints from tracings, engineering drawings, and other large-sized originals. It offers a 46-in. printing width with exposure speeds up to 95 in. per min. It is put into operation merely by connecting to a 60 cycle, 115-v. a.c. source.—*Charles Bruning Co.*

Electrical & Mechanical Briefs

Long-Life Bulb—800-w. incandescent lamp has life of 1,500 hr., 50 percent greater than regular bulbs. With built-in reflector. Price: $4.80. Westinghouse Electric Corp. *(194B)*

Speed Control—Type 1700-B uses selenium rectifier for instant starting and freedom from tube replacements. For ½-hp. motors. General Radio Co. *(194C)*

Metallizing Unit—New model Spray-welder features positive air and powder control valves and trigger mechanism with finger-tip control. Wall Colmonoy Corp. *(194D)*

Remote Speed Control—Packaged system for use with variable-speed transmissions. Sizes: 1/12 to 5 hp. Graham Transmissions Inc. *(194E)*

—*End*

An installation of B&G Hydro-Flo Heat Exchangers and Centrifugal Pumps.

Engineered or *"Off the Shelf"*

Hydro-Flo® HEAT EXCHANGERS

● B & G Type "OC" Hydro-Flo Heat Exchanger
An example of a straight tube unit

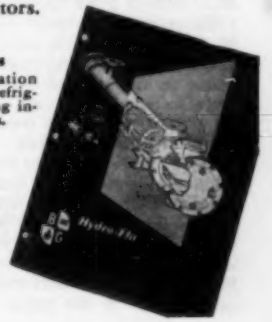
● B & G Type "U" Hydro-Flo Heat Exchanger
"U"-bend tube construction

The wide utility and capacity range of B & G *Hydro-Flo* Heat Exchangers permit many requirements to be satisfied with standard, or "off-the-shelf" units. Where special design or material is necessary, the B & G engineering staff is always available for consultation and equipment can be built to your specifications.

In either case, you'll find that B & G Heat Exchangers will meet your most critical appraisal. Sound design, backed by painstaking workmanship and rigid inspection assure equipment of top efficiency and long life. *B & G Hydro-Flo Products deliver more value per dollar because they are built that way!* ●

Send for Catalog DM-1150, which describes B & G *Hydro-Flo* shell and tube heat exchangers, oil preheaters, oil coolers, gas coolers, water heaters, refrigeration condensers and evaporators.

B & G Centrifugal Pumps
Complete line for application in process industries and refrigeration and air conditioning installations. Send for catalogs.

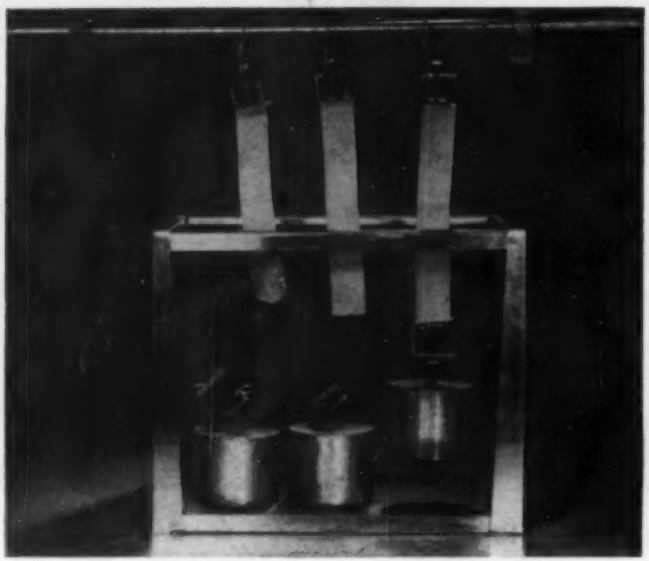


BELL & GOSSETT
COMPANY

Dept. CE-14, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada

*Reg. U. S. Pat. Off.



Neoprene-treated paper, right, supports a 2-lb. weight hours longer than untreated or commercial wet strength kraft when subjected to water or corrosive solutions.

Neoprene Widens Its Field

Family of low-cost specialty papers with high wet strength, chemical resistance and improved physical properties is the result of a new type of neoprene latex. (196A)

A new neoprene latex has been developed by Du Pont that can be incorporated in paper without changing standard mill equipment or practice. It imparts to the paper: wet strength, chemical resistance, all around improvement in physical properties such as elongation, burst strength, impact strength, scuff resistance, fold endurance, internal bond strength.

To produce this imposing list of properties, the latex is added to the pulp ahead of the wire, usually at the beater or headbox and cured in the dryer sections. Some manufacturers are already putting the treatment to use on a commercial scale. Applications of special interest to the chemical processing industries include: industrial filter paper, gasket paper, multiwall bag and general packaging paper. Du Pont itself will not make any of these papers. Its role will be to supply neoprene latex and technical assistance to the paper industry. The company's tests suggest new fields for paper where the physical limitations of the untreated variety have formerly rendered it impractical or uneconomical.

Chemical resistance tests, for instance, have shown that neoprene treated paper retains its strength to a greater extent than does untreated paper or conventional wet strength paper. In one test (see cut), 2-lb. weights were suspended from 1-in. strips of kraft paper and hung so that the weights and part of the test strips were immersed in test solution. Three kinds of paper were tested—commercial untreated 60-lb. kraft, a commercial wet strength kraft containing resin additive, and the same weight kraft containing 3 percent neoprene. Each paper was tested in three solutions—plain water, 10 percent hydrochloric acid and 10 percent caustic soda. In water: the untreated paper broke as soon as it was immersed; the resin treated paper broke after 72 hr.; the neoprene-treated paper was still holding when the test was discontinued after 86 hr. In hydrochloric: the untreated paper broke immediately; the resin treated paper broke after 6 min.; the neoprene treated paper broke after 4 hr. In caustic: untreated paper broke immediately; resin treated paper lasted 6 hr.; neoprene treated paper, 72 hr.

Small amounts of neoprene produce remarkable improvement in wet strength and a little improvement in dry strength. For instance, tests run on a 60-lb. unbleached kraft show that 2 percent neoprene, while it adds only 10 percent to the dry tensile, adds 530 percent to the wet tensile.

Filter paper, porous, unbleached 100-lb. kraft containing 5 percent neoprene is being made on a semi-commercial scale for use in industrial presses as a replacement for canvas filter cloth. Properties important in this use are wet strength and chemical resistance. The paper costs about 1/14 as much as the canvas it replaces. For multiwall bags, a 70/30 mixture of Southern and Swedish kraft containing 5 percent neoprene has been tested against normal bag paper of the same weight. The neoprene paper showed excellent chemical resistance and was found superior in many physical properties. Experimental shipments have been made in which standard 4-ply multiwall bags were successfully replaced by a 3-ply construction in which this neoprene treated paper was used as the outside ply.

Antioxidant

Fights color and odor changes in essential oils, light colored rubber products. (196B)

Developed by Shell Chemical Corp., Ionol is a trisubstituted sterically hindered phenol, specifically 2,6-ditert-butyl 4-methyl phenol. A relatively colorless crystalline product, it will not discolor on prolonged exposure to light, heat and air and does not form dark colored or insoluble oxidation products as a result of functioning as an antioxidant.

Effective in very small concentration, Ionol suggests itself as an antioxidant for organic materials such as rubber, mineral oils, animal and vegetable oils and fats, paints and other hydrocarbon systems. Recommended for both natural and synthetic rubber, it prevents breakdown of rubber upon

aging and its use is particualrly desirable in light colored stocks and in those formulations intended for use in contact with paints, lacquers, etc. Its efficiency in preventing decomposition of rubber due to presence of copper is greater than that of the other commonly used antioxidants.

Ionol is insoluble in water but soluble in a variety of alcohols, hydrocarbons, ketones, and oils. Due to the presence of the tertiary-butyl groups adjacent to the phenolic hydroxyl group, its reactivity is decreased to such an extent that it is not soluble in alkali of any strength and gives no indication of a hydroxyl group when subjected to the usual qualitative tests. Ionol does not react with acids, aldehydes, glycols or ether under normal conditions and is unusually stable when exposed to light, heat and air.

Ionol is now available in commercial quantities from Shell Chemical's Martinez, Calif., plant. It is shipped as a high-purity, light-colored, granular material in 100-lb. fiber drums. The price is 95 c. per lb. in less than carload quantities and 91 c. in carload quantities.

Lead Pigment

Threatens red lead's supremacy as a primer for coating steel surfaces. (197A)

At last the coating industry is to be offered a primer for steel which gives red lead's assets some lively competition and gets around a lot of its liabilities. Developers are Chemical Research Associates, Bernardsville, N. J., and its European associates, Chemisch Technisch Adviesbureau, Haarlem, The Netherlands.

Hiding power: compared to red lead, only half the weight of new pigment per gallon is needed to get equal results. Corrosion resistance: it contains twice as much lead peroxide (believed to be the most important corrosion inhibitor) as red lead. However, it has only ⅓ of the total lead content of the older pigment. It may be mixed with extenders up to 50 percent without losing its inhibition properties. On all these counts, its use constitutes a substantial savings in lead.

Color of the new pigment is light brown. Its predecessor's bright orange has always been accepted as a drawback about which nothing could be done. Of course, a few efforts have been made to make gray lead paint, for instance from metallic lead and lead-suboxide, which would produce simultaneously a primer and finish coating. Until now, these efforts have never turned up anything that could compete with the other advantages of red lead.

The new pigment does not require the topcoat which red lead must have. However, a paint layer with a minimum thickness of 100 microns is recommended for complete protection.

In linseed oil the new pigment dries well and the resultant coating has high resistance to sea water and weathering together with a much decreased tendency to blister. It tops zinc chromate, another red lead substitute, which cannot be used as a linseed oil vehicle since it does not promote drying as well as the red lead. Zinc chromate primers, which have achieved a definite place in industry, were developed during the last war to relieve the red lead shortage. Their special contribution has been in the formulation of so-called wash primers which, besides the pigment, contain a vinyl resin and dry very rapidly. The catch is that coatings of the wash primers are very thin and generally must be recoated with red lead paint.

Copper 3-Phenylsalicylate

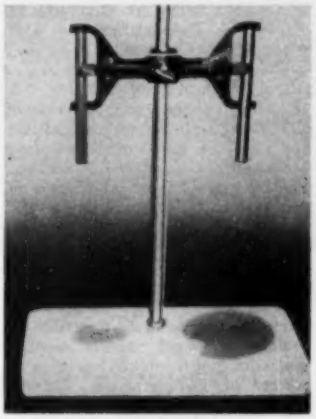
Textile preservative: odorless, non-harmful to skin. (197B)

Copper 3-phenylsalicylate is now available from Dow Chemical Co., Midland, Mich., in pilot plant quantities. Expanded production facilities will come into operation soon for the chemical, said to be a safe preservative for textiles and other materials subject to the attack of microorganisms.

The new compound has been approved by the Office of the Quartermaster General for use as an alternate material in the U.S. Government specification JAN-D-504. Wide use of the product is foreseen to treat fabric for tents, tarpaulins and other goods subject to the outdoors for both military and civilian users.

The preservative may be applied to fabric by the standard two bath process, from an aqueous dispersion, or from a solution in organic solvents. It imparts a very light tan color and virtually no odor.

Both Dow's toxicologists and outside private testing laboratories have reported copper 3- phenylsalicylate non-irritating and nonsensitizing to human skin and nontoxic to plant life.



Phosphate Coating

Rustproofs moving parts of iron or steel by increased retention of lubricating oil. (197C)

Only the cold-rolled steel rod, above left, was treated by Rustshield 2, new phosphate coating of Octagon Process, Inc., Staten Island. When equal amounts of oil were poured over each rod, the vastly superior absorption of the treated rod shows up in the difference in size of oil spots collected below.

Rustshield 2 meets the requirements for phosphate coatings in the U.S. Army Ordnance Specification 57-0-2C, Type II, Class A: "phosphate coatings finished with nondrying petrolcum oils containing corrosion inhibitors, suitable for use on sliding or bearing surfaces." The surface it produces is a coating resulting

(Continued)

IN BRIEF—A capsulated listing of this month's newsworthy products

It's New . . .	It's Good For . . .	See Page . . .
Neoprene Latex	Coating paper. Adds chemical resistance, strength	196A
Antioxidant	Insuring light colored rubber against staining	196B
Lead Pigment	Red lead substitute in coatings field	197A
Copper 3-Phenylsalicylate	Safe preservative for textiles exposed to outdoors	197B
Phosphate Coating	Rustproofing moving parts of iron or steel	197C
Adhesive	Giving long storage life to boil-proof glue	198A
Paint Stabilizers	Raising latex paint's resistance to water, freezing	198B
Foam Core	Core material with high structural strength	198C
Plasticizer	Low cost plasticizing of vinyl compounds	198D
Teflon Dispersions	Resistant coatings for glass cloths, other fabrics	198E
Vinyl Plastic Coverall	Protecting heavy machinery during transport	200A
Resin Coating	Lining steel shipping containers	200B
Rubber Latices	Impregnating, coating, compounding	202A

Don't Forget: Reader service postcard inside back cover will bring you more information. Use these key numbers.

from chemical interaction of the phosphate solution and the metal surface; thus it has a greater adherence than any physically-bonded coating could have.

Rustshielding is an immersion process which consists of precleaning with vapor degreaser, safety solvent or an especially designed alkali cleaner. Cleaning is followed by rinsing, Rustshielding, rinsing, and final treatment with a passivating agent. The Rustshield liquid is applied by hot immersion and, outside of a stainless steel tank, requires no special equipment.

Adhesive

Resorcin-phenol, boil-proof glue can be safely stored for a year. (198A)

A new low-cost resorcin-phenol adhesive which meets military specification MIL-A-379A has been developed by the Borden Co.'s chemical division. Called Casophen LT-68, it is an improved modification of Casophen LT-67. The latter was the first boil-proof glue developed for commercial use that could be cured at intermediate temperatures.

A big advantage of LT-68 over its predecessor is that it can be stored for a full year without sacrificing any of its working properties or the quality of the bond. LT-67 had a storage life of only six weeks.

Casophen LT-68 will enable manufacturers of defense materials to stretch hard-to-get resorcin supplies, since the glue contains less than 20 percent of this ingredient. For this reason, LT-68 costs less than any other resin-phenol glue that meets the above specification.

Paint Stabilizers

They provide latex paint with: high resistance to water and freezing, more brillant color, easier brushing. (198B)

The Borden Co.'s chemical division has developed *six* new stabilizers for latex paints. These are solutions which stabilize the paint's emulsion. They account for 10-25 percent of the paint's total weight.

The products are marketed under the trade names Cascola, Cascolac and Protovac. Two are powders, the others are liquids. Advantages include: elimination of heating and mixing preparations and storage problems, high water resistance, improved resistance to freezing, more brilliant color and easier brushing.

Foam Core

Phenolic material with high compressive strength has good adhesion to wood, paper, plastics. (198C)

A new phenolic foam core material, with compressive strength up to 500 psi., is available for immediate delivery from Rezolin, Inc., Los Angeles. Called Corfoam, it is a liquid phenolic resin which, when mixed cold, will foam to a hard consistency without applied heat at room temperature. It is of honeycomb appearance with tiny globular nonconnecting cells and has a density of approximately 14 lb. per cu. ft.

Corfoam can be foamed in large masses without loss of cell control or undue shrinkage. It will not soften under heat and tests show it has excellent insulating characteristics. It has good adhesion to wood, paper and most plastics and will not support combustion. Its moisture absorption is low.

Plasticizer

For vinyl compounds. Imparts flame retardance and very good electrical properties. (198D)

Vinyl fabricators are being offered a new low cost plasticizer particularly useful for film, sheeting, electrical wire coating. Hooker Electrochemical Co.'s MPS-500 is a stabilized, chlorinated fatty acid ester. Chlorine content is controlled to give an optimum balance between compatibility and plasticizing efficiency.

It is completely compatible with polyvinyl chloride in amounts up to 60 parts per hundred, and for some applications it can be used as the sole plasticizer. However, a mixture of plasticizers is usually necessary to achieve a desirable balance of properties. MPS-500 can be used with most primary plasticizers, but extenders to be used in such combinations should be carefully selected.

The chlorine content of MPS-500 has an important effect upon flame retarding. It is possible to produce flame retardant compositions with improved low temperature flexibility and migration.

The present shortage of conventional plasticizers such as tricresyl phosphate and dioctyl pthalate makes this development timely. Used alone MPS-500 compares closely with TCP in efficiency. However, it is superior to the latter in low-temperature flexibility. When used in composition with DOC, it improves flexibility, volume resistivity, heat aging, loss of plasticizer on aging, flame retardance.

Teflon Dispersions

Du Pont brings up to date its application suggestions for two-year-old aqueous colloidal dispersions. (198E)

Du Pont chemists have just come out with some new ways in which the chemical and electrical industries can make use of the high chemical and heat resistance, excellent insulating properties and anti-adhesiveness of the company's dispersions of tetrafluoroethylene resin in water.

Detailed information is available on methods for casting unsupported film and on applications of Teflon dispersion in coating glass cloth. Films cast from Teflon dispersion, which can be made as thin as 0.00025 in., are expected to find application for various insulation purposes where mica is now used, particularly in the development of new and more compact radar equipment. Glass fabrics coated or impregnated with Teflon tetrafluoroethylene resin also should find numerous uses in the insulation field. Already they are finding important applications in aircraft electrical systems.

Tough, nearly transparent films may be cast from colloidal dispersions of the plastic formulated with from 6 to 10 percent of a suitable dispersing agent which serves to stabilize the dispersion and to promote the spreading or casting of uniform films. Film preparation involves four distinct steps: (1) casting on a flat metal surface; (2) drying to remove the water; (3) baking at temperatures above 327 deg. C.; (4) cooling the baked films. The process for coating or impregnating fabrics is similar.

Rapid stirring of unstabilized Teflon dispersion results in coagulation of the dispersed resin particles. When mixed with certain lubricants, this coagulated resin forms a paste which may be extruded at ordinary temperatures. With only simple equipment

(Continued)

"Wonder-worker" for the wonder drugs

How Celite filtration assures purity, speeds production

When producers of antibiotics sought a filter aid that would assure removal of all mycelium and other gelatinous impurities in the broth from which wonder drugs are extracted—and speed their "put-through" in the bargain—Celite ended the search.

The effectiveness of Celite can be attributed to these important factors which make it unique among filter aids:

Carefully processed from the purest deposit of diatomaceous silica known, Celite is available in nine standard grades—each designed to trap out suspended impurities of a given size and type. Whenever you reorder, you are assured of the same uniform, accurately graded powder received in your initial order. Thus, with Celite, you can count on consistent purity in your filtrates—at highest rate of flow—month after month, year after year.

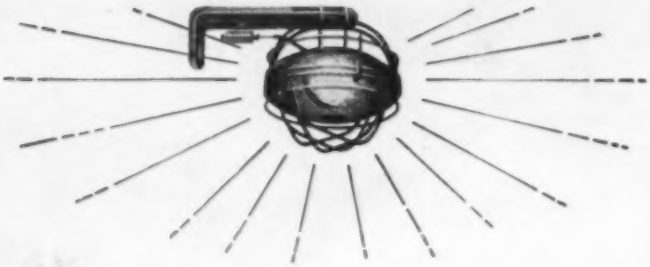
The manufacture of wonder drugs is just one of the many processes in which consistent purity and faster filtration have been obtained through the use of Celite. Your own filtration problem, regardless of the product involved, can no doubt be solved with the proper grade of Johns-Manville filter aid. To have a Celite Filtration Engineer study your problem and offer recommendations, without cost or obligation, just write Johns-Manville, Box 290, New York 16, N. Y.

Celite is a registered Johns-Manville trade mark

JM PRODUCTS

Johns-Manville CELITE

FILTER AIDS



THE FIRE WATCH
THAT NEVER SLEEPS

ARE you ready for fire *when* it strikes? Week ends? Nights? During shut downs? Put a Kidde Automatic Fire Extinguisher System on the job—it's *always* on the alert against fire.

The heat from a fire hits the Kidde detector ... sends a signal that releases flame-smothering carbon dioxide automatically. Such a system can protect a single space ... or many spaces throughout the plant.

Wherever a hazard exists—in engine rooms, fuel storage rooms, document vaults, electrical equipment—you can depend on fire-sensitive, fast-acting Kidde automatic or manual systems to protect your property. Call on us for full information.

Kidde

Walter Kidde & Company, Inc.
1028 Main St., Belleville 9, N. J.

Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

coagulation can be achieved in about five minutes. The coagulate which collects at the top of the container is filtered and dried before mixing with the lubricant used to impart the required physical properetics.

Vinyl Plastic Coverall

Economical protection for big machinery during periods of exposure. (200A)

Utilizing Monsanto's Ultron vinyl film, the Army Ordnance Corps has developed a plastic covering for heavy machinery that will: retain its original properties under outdoor exposure and service conditions; not become brittle and crack or shatter in sub-zero temperatures; withstand constant wind-whipping on open flatcar shipments and temporary out-of-doors storage.

Working with the National Transparent Plastics Corp. and with Monsanto's plastics division, the Ordnance Corps has developed about 50 different sizes of shrouds. The range provides a general conforming envelope type to meet the many sizes and shapes of machinery involved. The coverings include carefully controlled electric welds, reinforcements at critical points of heavy strain and properly located tie-down grommets.

An additional feature of this method of protection has been achieved through the use of a volatile type corrosion inhibitor. This material builds up a free and continuously recurring atmosphere under the shroud that prevents rusting of precision surfaces even though moisture from condensation or other phenomena settles out under the shroud. This additional contribution was largely the work of the Marvellum Paper Co.

Resin Coating

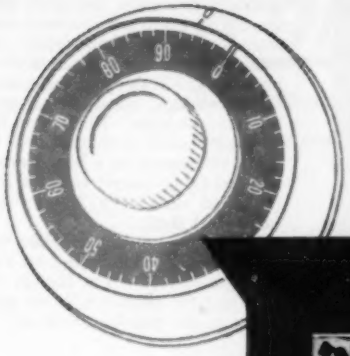
Nontoxic liner for steel containers resists broad range of chemicals and mechanical shocks. (200B)

Now available commercially is a new Epoxy resin protective coating-liner called Synthetasine 100. According to Synthetasine Protective Coatings, Inc., New York licenser of the new product, its mechanical and chemical resistance broadens the field of products to be successfully shipped in lined steel containers.

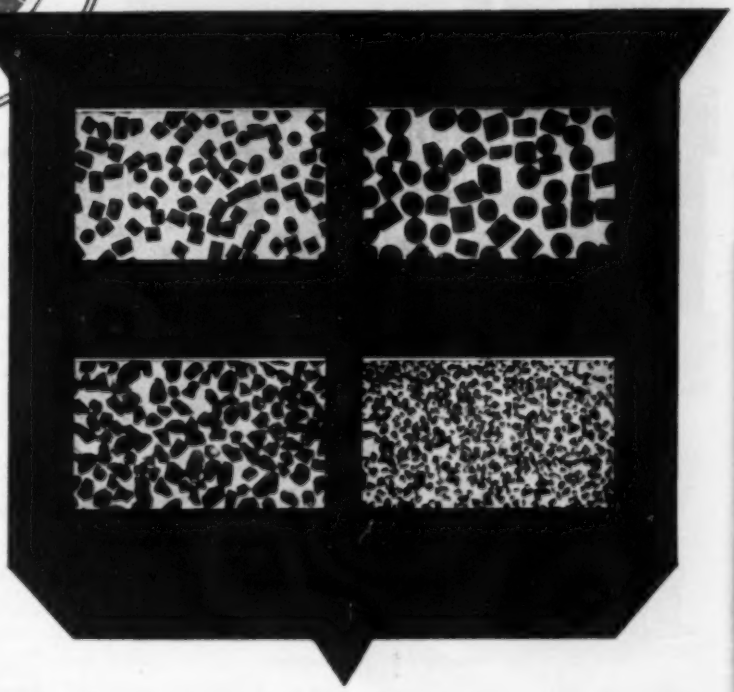
Battelle Memorial Institute developed the product to resist alkalis, dilute mineral acids, chlorinated sol-

(Continued)

For the RIGHT COMBINATION of Properties



use COLUMBIA TRADE-MARK ACTIVATED CARBON



We supply special activated carbons for all *gas* and *vapor adsorption* applications. Several grades are produced specifically for:

- Solvent Recovery
- Air Deodorization and Purification
- Industrial and Military Gas Masks
- Purification of Industrial Gases
- Separation and Purification of Hydrocarbon Gases (moving beds)
- Catalysis of Vapor-Phase Reactions

CARBIDE AND CARBON CHEMICALS COMPANY

A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.

COLUMBIA *Activated Carbon*

SOLVENT RECOVERY · CATALYSIS
GAS AND AIR PURIFICATION

There is no *one* activated carbon for *all* uses. Optimum characteristics vary with each application. The *right combination* of properties is required in an adsorbent for most effective results. And there is a COLUMBIA Activated Carbon with the combination you need.

Let us help you select the proper COLUMBIA Activated Carbon for your particular job—the grade that combines the best particle size and shape, active surface area, adsorptive and catalytic properties, ash content, hardness, and mechanical strength.

Write today, describing your application, and our engineers will give you further detailed information.

"Columbia" is a registered trade-mark of Union Carbide and Carbon Corporation.

P-28664

Sure we're up-to-date in fluid techniques . . .

(see opposite page)

BUT DO YOU KNOW WHAT WE CAN DO FOR YOU IN

ION-EXCHANGE ?

Dorrco D-I System installed at a Norwegian Chemical Plant.

for instance, do you know that . . .

DORR *can place at your disposal* any portion of a complete service for handling ion-exchange problems . . . from problem analysis to initial plant operation.

DORR *can supply equipment* for the treatment of water, and chemical or sugar bearing solutions of all kinds; for the extraction and concentration of some of the valuable metals from dilute solutions . . . in any capacity you require.

DORR *will work with you* on any phase of your ion-exchange program . . . whether it involves established principles or a new and confidential process.

If you are currently exploring the possibilities of ion-exchange for new processes or those already established we believe we can help you. And you'll find our ion-excha ıge facilities backed by solid chemical engineering knowledge.

Bulletin #4081 lists the high-spots of Dorrco D-I* Systems. Write to Ion-Exchange Sales, The Dorr Company, Barry Place, Stamford, Conn.

*DI is a trademark of The Dorr Company

DORR

WORLD - WIDE RESEARCH - ENGINEERING - EQUIPMENT

THE DORR COMPANY - ENGINEERS - STAMFORD, CONN.

Offices, Associated Companies or Representatives in the principal cities of the world

NEW PRODUCTS, cont. . .

vents, formaldehyde (36-38 percent aqueous), detergents, detergents combined with hydrocarbon solvent, fatty acid, emulsions. Synthetasine 100 combines flexibility and resistance to normal abuse in shipping and moving lined containers, not shattering easily like pure phenolic. Tests show that it is not cracked or chipped by a 60-in.-lb. blow struck on a ½-in. diameter rounded tip in contact with the back (uncoated side) of a 22-gage cold-rolled steel sheet.

Indications are that the white liner is inert and should impart no toxic character to foods. The licenser also feels that the coating will find application in the petroleum industry.

Rubber Latices

Tailored for specific applications in coating, impregnating, compounding. (202A)

Four new synthetic rubber latices have been added to Goodyear's Chemigum line. Aqueous dispersions of butadiene, they are acrylonitrile copolymers designed particularly for use in coating, impregnating, and compounding applications requiring unusual adhesion or resistance to oils, greases, alcohols, glycols and most solvents.

In the 235 series, Chemigum, Latices 235AHS, 235C and 235CHS have been added to expand possible applications. The 235 series is characterized by a butadiene to acrylonitrile ratio of 55/45. Chemigum Latex 245AHS has been added to the 245 series, characterized by a butadiene to acrylonitrile ratio of 67/33.

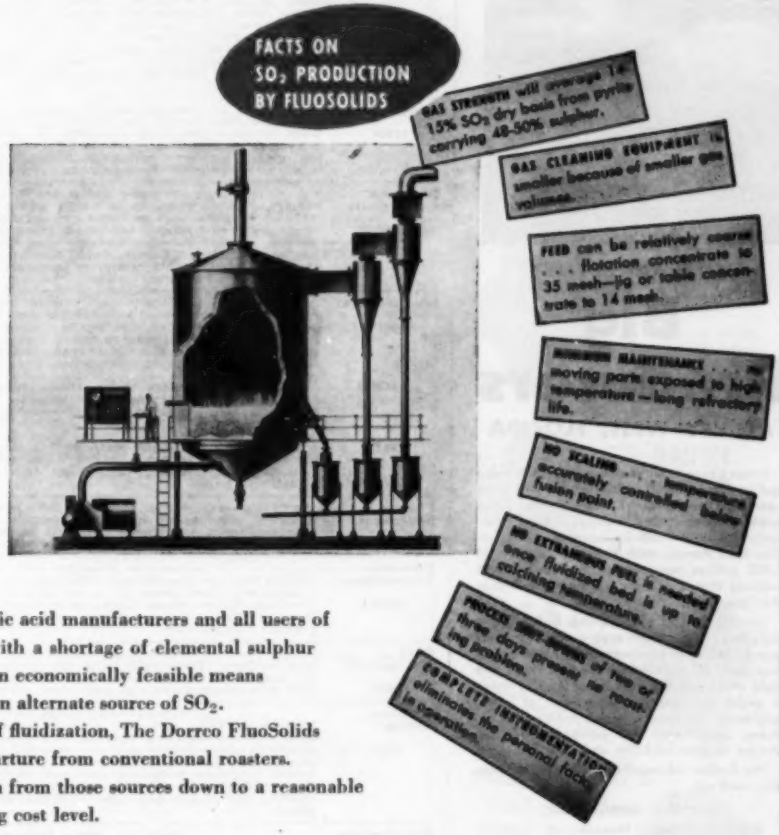
Alphabetical designations within each series refer to the type of stabilization. In the 235 series, Chemigum, Latex 235AHS is a high solids modification of the older Chemigum Latex 235A and is stabilized with an ammonia soap. Chemigum Latex 235C and 235CHS contain a synthetic anionic stabilizer to insure stability in processes which tends to increase the hydrogen ion concentration of the latex. A typical use is in saturating processes where the impregnant is deposited by repeated passes of a web through the bath without coagulation of the latex. Continuous contact with the acid salts in most cellulose fibers will precipitate the solids of ordinary latex. Chemigum 235CHS is a high solids modification of 235C.

Within the 245 series, 245A now has a high solids counterpart in the new 245AHS. The high solids latices give a greater solids pick up in some processes and are more economical to ship and store. —*End*

Can you use

14-15% SO_2 GAS from PYRITE

Dorrco FluoSolids* will produce it . . . at lower investment and operating costs than conventional roasters.


FACTS ON SO₂ PRODUCTION BY FLUOSOLIDS
GAS STRENGTH will average 14-15% SO_2 dry basis from pyrite carrying 48-50% sulphur.
GAS CLEANING EQUIPMENT is smaller because of smaller gas volumes.
FEED can be relatively coarse . . . flotation concentrate to 35 mesh—jig or table concentrate to 14 mesh.
MINIMUM MAINTENANCE . . . no moving parts exposed to high temperature—long refractory life.
NO SCALING . . . temperature accurately controlled below fusion point.
NO EXTRANEOUS FUEL is needed once fluidized bed is up to calcining temperature.
PROCESS SHUT-DOWNS of two or three days present no roasting problem.
COMPLETE INSTRUMENTATION eliminates the personal factor in operation.

● Sulphuric acid manufacturers and all users of sulphur dioxide faced with a shortage of elemental sulphur will find in FluoSolids an economically feasible means of tapping sulphides as an alternate source of SO_2. Utilizing the principle of fluidization, The Dorrco FluoSolids System is a distinct departure from conventional roasters. It brings SO_2 production from those sources down to a reasonable investment and operating cost level.

Its economy, simplicity and ease of operation are indicated by the facts above. For more detailed information write to The Dorr Company, Stamford, Conn., or in Canada, The Dorr Company, 80 Richmond Street West, Toronto 1.

*FluoSolids is a trademark of The Dorr Company, Reg. U. S. Pat. Off.

Bulletin Tells TODAY. Write for your copy

DORRCO

DORR

WORLD-WIDE RESEARCH - ENGINEERING - EQUIPMENT

THE DORR COMPANY • ENGINEERS • STAMFORD, CONN.

Offices, Associated Companies or Representatives in the principal cities of the world

ONE OF SEVEN

Big Producers

AT KEY WEST, FLORIDA

Seven Layne Well Water Supply units, each testing around 8,000 gallons per minute, have been installed to furnish cooling water for a power project at Key West, Florida. Permanent installations will be Layne Vertical Turbine type Pumps, each having a capacity of 2,300 gallons per minute. Preliminary tests indicate that efficiency will be much higher than promised.

Layne's method of designing, building and installing well water supply units is fully proven in higher production and lower operation cost. All installations are by Layne's own field crews and the work, from start to finish, is under the constant supervision of Layne engineers. Thoroughly tested before final delivery, Layne wells and pumps provide the utmost in dependability and long life.

For further information, catalogs, bulletins etc., address

LAYNE & BOWLER, INC.

General Offices, Memphis 8, Tenn.

FOR CITIES, FACTORIES—

and plants of all kinds. Layne contracts for and builds complete well water supply systems of any size or capacity for cities, factories, ice plants, paper mills, pipe lines, petroleum refineries, air fields, chemical plants, packing plants, railroads, irrigation farming—or any situation where big quantities of well water must be obtained at extra low cost.

Layne WATER SUPPLY WELLS & PUMPS

CE's Guide to . . .

NEW TECHNICAL LITERATURE

Reader Service numbers. Circle them on the postcard inside the back cover to get free booklets.

What's New In . . .	How to . . .	Company . . .
Valves 204A	. . . prevent galling and sticking when guiding surfaces are isolated from the lading fluid; eliminate back pressures in a discharge manifold. Operating principles of this company's Farriseal and Balanseal safety relief valves. Effect of back pressure; valve sizing with collecting systems; design of discharge piping; and test data. Drawings, graphs, and formulas. 24 pages.	Farris Engineering Corp.
Pumps 204B	. . . control volume pumping. Data on Milton Roy pumps for specific applications. Uses for these pumps in a variety of chemical process industries. Four pages of color charts on the relative corrosion resistance of materials of construction to over 170 chemicals. 24 pages.	Milton Roy Co.
Blowers & Compressors 204C	. . . eliminate pulsation. Comprehensive data on three types of De Laval centrifugal blowers and compressors: multistage, single stage, and suction and single stage double suction. Application, design and construction. Engineering data: curves, formulas, and examples for computing compression gases and pipe friction. 51 pages.	De Laval Steam Turbine Co.
Ion Exchange 204D	. . . soften water with a styrene type cation exchanger, Nalcite HCR. Data, supplemented with tables and graphs, give performance under various operating conditions. Physical characteristics. Exchange capacities. Regeneration techniques. 28 pages.	National Aluminate Corp.
204E	. . . soften water with a synthetic gel type zeolite exchanger, Super Nalcolite. Performance, characteristics, capacities, and techniques. 8 pages.	
204F	. . . deionize water with a strongly basic anion exchanger, Nalcite SAR. Performance, characteristics, capacities, and techniques. 15 pages.	
Process Equipment 204G	. . . select this equipment: steam turbines, condensers, ejectors, turbochargers, tube cleaners, centrifugal blowers, deaerating heaters, and strainers made by Elliott. 17 pages.	Elliott Co.
Pressure Transmitters 204H	. . . measure pressures with transmitters that feature differential transformer type transducers. Description of a complete line of Ateotran transmitters. Data, operational features, available ranges, wiring and case diagrams. 4 pages each.	Temperature Control Co, Inc. Automatic
Heat Exchangers 204I	. . . prevent fouling of the inner pipe surfaces. Description with illustrations of the Vogt scraped surface exchangers. Double pipe type, and the shell and pipe type. Uses. 9 pages.	Henry Vogt Machine Co.
Seamless Tubing 204J	. . . fabricate and design nickel and high-nickel alloy pipe and tubing. Includes a method for calculating bursting and collapsing strengths of commercial seamless pipe and tubing to meet ASME Boiler Construction Code requirements. Tables on mechanical and physical properties, ASME code requirements, recommended welding procedures and other information. 27 pages.	International Nickel Co., Inc.
Gas Analysis 204K	. . . maintain and operate the equipment. Fourth revised edition of the Fisher Gas-Analysis Manual. New techniques. Detailed description of an assortment of Fisher apparatus. 60 pages.	Fisher Scientific Co.
Packaging 204L	. . . meet government packaging specifications. Information on current Army, Navy and Air Force requirements. Illustrations of types of packaging procedures for packing. 36 pages.	Mehl. Mfg. Co.
Fastenings 204M	. . . instantly identify stainless steel nuts, screws, bolts, rivets, cotter pins and washers that are listed in A-N specifications. A new Anti-Corrosive slide chart.	Anti-Corrosive Metal Products Co., Inc.
Packaging 204N	. . . reduce shipping costs and packaging overhead by using Allegheny products. Descriptions with illustrations of strapping, seals, tensioners, sealers, and accessories. 6 pages.	Allegheny Steel Band Co.
Pumps 204P	. . . apply this company's Class APH-APK line of vertical, turbine-type pumps to bulk liquid transfer, cooling tower, dewatering and similar services where suction is taken from an open source. Construction and installation photographs. Dimension diagrams. 8 pages.	Ingersoll-Rand Co.

What's New

In . . .	How to . . .	Company . . .
Steam Traps 205A	. . . select the proper trap for a variety of common process and industrial equipment. Tables show trap capacities for each type of equipment. A supplement to the Yarway catalog. 20 pages.	Yarnall-Waring Co.
Gas Analysis 205B	. . . detect air pollution by SO_2. Description of the integrating and non-integrating type of Thomas autometer. New application of the electronic Speedomax Recorder to the autometer equipment. Flow diagrams showing the operating sequence of the equipment. List of equipment. Specifications. 8 pages.	Leeds & Northrup Co.
Silica Cement 205C	. . . use Vega Bond super-duty silica cement. Illustrations of comparative effects of heat treatment, refractoriness, trowelling and setting. 4 pages.	Harbison-Walker Refractories Co.
Tachometer Indicators 205D	. . . monitor speeds of many remotely located machines from one location. Description of Metron's new multiple head, single range, fixed installation tachometer indicator.	Metron Instrument Co.
Motors 205E	. . . meet ASA requirements for indoor-type splash-proof construction: Construction features of the Allis-Chalmers large end-shield bearing squirrel-cage induction motors. 6 pages.	Allis-Chalmers
Lift Trucks 205F	. . . save space by means of palletized carloading; drawings showing methods. Features and specifications of two new Barrett hydraulic lift trucks, developed for one-man handling of heavy pallet loads. 15 pages.	Barrett-Cravens Co.
Paints 205G	. . . use Thermindex temperature-sensitive paints. Table of color ranges. Graph showing relationship between temperature of color change and heating time. Color transition chart. 3 pages.	Tempil Corp.
Bucket Carriers 205H	. . . move wet or dry bulk materials: Construction features of the Hapman pivoted bucket carriers. Examples of typical circuits that may follow horizontal, vertical or inclined paths. 4 pages.	Hapman-Dutton Co.
Blow-off Valves 205I	. . . save steam and reduce operating costs in the lower pressures as in the higher pressures. Construction features of Yarway valves: type A and B seatless valves, and double-tightening valves. Materials specifications. Styles for various pressures. Prices, weights and dimensions. Parts prices. Typical installations. 23 pages.	Yarnall-Waring Co.
Motor Starters 205J	. . . insure safety in atmospheres charged with explosive dusts or vapors: Construction features of the new AH Explo-safe and weatherproof motor starters. Dimensions, weights, ratings and wiring diagrams. 8 pages.	The Arrow-Hart & Hegeman Electric Co.
Analysis 205K	. . . use such instruments as the automatic recording gas analyzer, infrared analyzer, infrared spectrophotometer, in the plant and in the laboratory. Numerous graphs provide illustration. 12 pages.	Baird Associates, Inc.
Materials Handling 205L	. . . handle a wide variety of materials with electric vibrating feeders and conveyors. Construction and installation photographs, dimension drawings, general specifications for models of various capacities. Where and how to apply various members in the line. 36 pages.	Jeffrey Mfg. Co.
Cast Irons 205M	. . . control the engineering properties of cast iron to meet almost any combination of service requirements through the use of nickel alone or in combination with other alloying elements. Primarily for design engineers: 27 tables, charts and photomicrographs; 50 illustrations indicating wide industrial usage in all sizes and shapes. 28 pages.	International Nickel Co.
Electrical Accessories 205N	. . . select thermocouple and extension wires from a chart of calibration symbols and color codes. Available in all standard calibrations, these wires are insulated with low and high temperature plastics, braided or served asbestos, cotton or fiberglass. Reverse side of the chart contains resistance tables for pyrometer wires.	Thermo Electric Co.
Tubing 205P	. . . pick the right steel tubing for applications in the chemical, petroleum, pulp and paper, food and processing industries. Analyses and tables of physical and mechanical properties as well as application data for 20 carbon, alloy and stainless tubing steels. 8 pages.	Babcock & Wilcox Tube Co.
Waxes 205Q	. . . make the best use of microcrystalline petroleum waxes. For a wide range of waxes, tables give specifications, general properties, electrical properties, dielectric constant. Curves show compatibility with other waxes, solubility in commercial solvents, thermal expansion and melting points. 12 pages.	Petrolite Corp., Ltd.

(Continued)

Catawissa
PERFECT SEAL
Unions

HOT FORGED from solid RECTANGULAR STEEL BARS to give you SURE-FIRE PIPING DEPENDABILITY

A TYPE FOR EVERY USE! PERFECT SEAL even with pipe not in alignment!

Standard & Double Extra Heavy
UNIONS
Available with screwed or socket weld ends. 3000-lb. sizes ⅛" to 3"; 6000-lb. sizes ⅛" to 2".

ORIFICE UNIONS
With screwed or socket weld ends. 3000-lb. and 6000-lb. service.

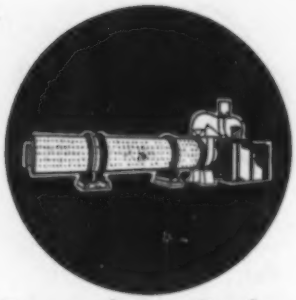
MALE & FEMALE UNIONS
With steel-to-steel, bronze-to-steel, stainless steel-to-steel or orifice seats. 3000-lb. service only.

FULL STAINLESS & FULL ALLOY STEEL UNIONS
With screwed or socket weld ends. 3000-lb. and 6000-lb. service.

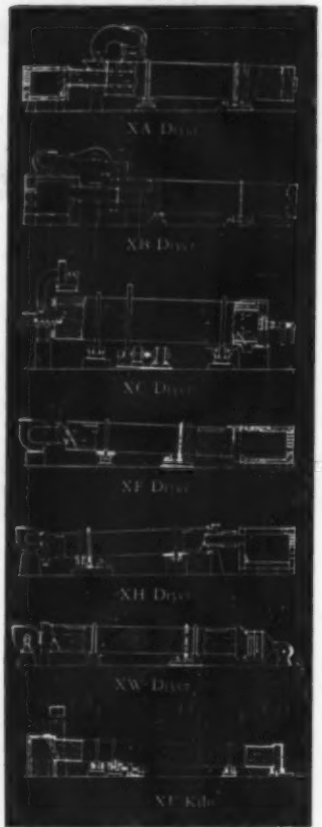
CATAWISSA Ends Guesswork in Union Requirements!

CVF *write for CATALOG 11 showing the complete Catawissa line*

CATAWISSA VALVE AND FITTINGS COMPANY
100 Mill St. • Catawissa, Pa.



Ruggles-Coles
ROTARY DRYERS
in 7 types . . .



Write Hardinge for Bulletin 16-D-11 which describes the entire line of Ruggles-Coles Rotary Dryers, Kilns and Coolers.

HARDINGE
COMPANY INCORPORATED
YORK, PENNSYLVANIA—240 Arch St. Main Office and Works
NEW YORK 17 • SAN FRANCISCO 11 • CHICAGO 5 • HIBBING, MINN. • TORONTO 1
122 E. 42nd St. 24 California St. 205 W. Wacker Dr. 2016 First Ave. 200 Bay St.

What's New

In . . .	How to . . .	Company . . .
Anhydrides **206A**	. . . specify, test and use acetic, propionic, butyric, Carbic, and tetrahydrophthalic anhydrides. Includes physical property charts, detailed methods of testing, bibliography of the pertinent literature. 20 pages.	Carbide and Carbon Chemicals Co.
Soybean Products **206B**	. . . keep posted on the new corticosteroids, cortisone and male and female sex hormones, all derived from soybeans. 16 pages.	Glidden Co.
Glass Blocks **206C**	. . . save critical materials in building and remodeling plants by exploiting the advantages of glass block. Illustrations of glass block installations which have solved problems of moisture, cold, excessive glare and maintenance. Step-by-step series of photographs followed by dimension tables and technical data on the correct method of installation in various types of walls encountered in industrial plants. 16 pages.	American Structural Products Co.
Refractories **206D**	. . . analyze your need for refractory material and to decide on the right one. Facts and figures on materials built for resistance to corrosion or abrasion, high hot strength, chemical inertness, or a wide range of thermal conductivities. Charts detail properties available, photographs show shapes, installations. 22 pages.	Carborundum Co.
Mixers **206E**	. . . find an industrial mixer designed for the job you have. Pictures a line of heavy-duty portable industrial mixers: direct drive, geared, explosion-proof, side entering, agitator drum, flange mounted and vertical flange mounted. 6 pages.	Greuler & Co.
Reagents **206F**	. . . find specifications and price information on a complete line of reagents and other laboratory chemicals. July, 1951, catalog presents data in concise form; contains explanatory information to facilitate its use. 256 pages.	J. T. Baker Chemical Co.
Piping **206G**	. . . approach the design of discharge header systems and partially or completely eliminate back-pressure effects on tied-in safety-relief valves. Operating test data, much of it presented in graphs, on the company's line of bellows-type safety-relief valves. Analysis of the economics of standard design practice as it effects the cost of pressure relief in closed systems where control or recovery of the lading fluid is essential. 40 pages.	Farris Engineering Co.
Materials Handling **206H**	. . . design and specify belt idler equipment. Line of idlers is pictured with dimension charts and diagram. Latest data on lubrication material and techniques, correct maintenance procedure. Large cross-section shown of steel and cast gray iron idler rolls. 42 pages.	Chain Belt Co.
Instruments **206I**	. . . solve special boiler water level control, liquid level control and relief valve problems. Instruments for use in the less widespread application in these fields are illustrated and described in this supplemental catalog. 20 pages.	McDonnell & Miller, Inc.
Instruments **206J**	. . . determine which recording systems—complete, or as separate units for integration in your equipment—may fit your recording needs. A group of seven two-page bulletins picturing and describing: galvanometers and recorders, amplifiers, complete recording systems.	Sanborn Co.
Fork Trucks **206K**	. . . get the benefits of the major components of a line of type FC fork trucks which are available in capacities of 3,000, 4,000, and 6,000 lb. Dimension drawings show maneuverability, detailed specifications, action pictures. 8 pages.	Baker Industrial Truck Division
Materials Handling **206L**	. . . dry-screen light and fine materials fast and accurately with this company's Model UP vibrating screens. Also covers model NRM screen for high speed separation of solids from liquids. Dimension tables, weights, horsepower requirements. Photographs of actual installations. 20 pages.	Link-Belt Co.
Motors **206M**	. . . pick the right motor for a range of applications from central station auxiliary to general industrial drives. Pictures squirrel-cage induction motors available in ratings and speeds up to 1,750 hp. at 1,800 rpm. 4 pages.	Allis-Chalmers Mfg. Co.
Instruments **206N**	. . . use this company's contact meter-relays, controls, pyrometers, panel meters and relays. Circuit diagrams, listing of sizes, ranges and prices. 35 pages.	Assembly Products Inc.
Pipe Joints **206P**	. . . eliminate the cost and time consuming methods of pre-engineering and prefabrication sections of rubber-lined pipe. Construction and installation illustrations on rubber-lined pipe joint system. List of fittings and specification plus a corrosion list to which this company gaskets and linings are resistant.	Gates Engineering Co.

—End

TERM OF ACTIVITY FOR THESE TROUBLEMAKERS HAS

Expired

. . . YOU CAN SAY EXACTLY THAT WHEN YOU INSTALL THE . . . .

CASH STANDARD Streamlined PRESSURE REDUCING VALVE TYPE 1000

THESE ARE THE BENEFITS YOU GET

1. Maximum capacity when needed most.
2. Accurate pressure control under toughest working conditions.
3. Trouble-free service.
4. Smooth operation.
5. Tight closure.
6. Speedier production results.
7. Elimination of failures.
8. Cost-saving operation.
9. No spoilage.
10. Practically zero in maintenance.

USERS TELL THE BENEFITS . . .

"Our CASH STANDARD '1000' valve is used on a steam motor car to reduce the boiler pressure from 800 psi to 100 psi for the operation of a turbo generator for driving the fuel oil burner and blower. It operates by means of a pressure operated relay valve when the vehicle is not running, every time that the fire under the boiler goes on and also floats a storage battery on the line. I like the CASH STANDARD '1000' reducing valve because it is SIMPLE IN CONSTRUCTION, LIGHT IN WEIGHT, AND REQUIRES PRACTICALLY NO MAINTENANCE."

—from an engineer

"The CASH STANDARD '1000' Valves that we have in this plant are proving most SATISFACTORY IN ALL RESPECTS."

—from a manufacturer

"Most of our Type '1000' Valves have been in service for about 4 years and HAVE NOT REQUIRED ANY ATTENTION in that time except to adjust for different pressure requirements."

—from a manufacturer

"The CASH STANDARD '1000' Valves that we have in use have given us ABSOLUTELY NO TROUBLE and are preferred by our engineers to anything else on the market."

—from a vice president

"The ELIMINATION OF STEAM LEAKS and LOW MAINTENANCE COST have been especially gratifying. The LOW INITIAL COST, LOW MAINTENANCE, and TROUBLE FREE OPERATION results in the MOST ECONOMICAL PRESSURE REDUCING VALVE we have been able to purchase."

—from an instrument engineer

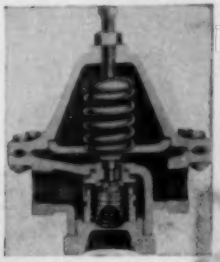
WRITE FOR BULLETIN 962

CASH STANDARD CONTROLS.. VALVES

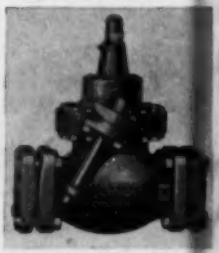
A. W. CASH COMPANY
DECATUR, ILLINOIS

BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES

Send for them

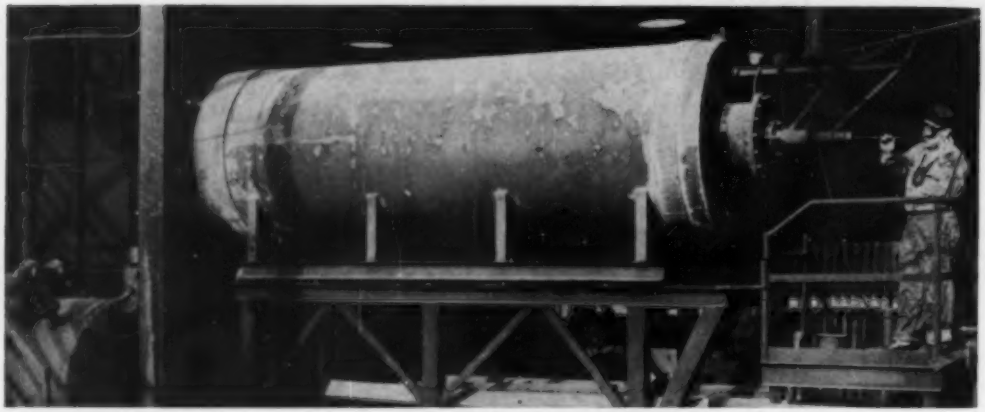


Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.



Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.

Bulletin 986—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.



1 Production of anhydrous HCl at Diamond Alkali's Painesville, Ohio, plant starts here. Dried and compressed chlorine gas from electrolytic cells is burned in an excess of hydrogen gas in this cylindrical horizontal bricklined furnace.

Anhydrous HCl

A CHEMICAL ENGINEERING PICTURED FLOWSHEET

Uses The large demand for anhydrous hydrogen chloride is for the production of methyl chloride, ethyl chloride and vinyl chloride. It is estimated that these three products alone will use around 250,000 tons of anhydrous HCl in 1951. There are other minor uses, possibly the most important one being as a catalyst in petroleum reforming.

Diamond engineers have developed a process for the manufacture of anhydrous HCl using burner acid from cell chlorine and hydrogen, or using the byproduct HCl from organic chlorination. The flowsheet pictures the process as adapted for burner HCl.

Burning Cell chlorine is burned in an excess of hydrogen in a horizontal, brick-lined cylindrical furnace. The furnace is operated at slightly subatmospheric pressure, the hot gases passing from the furnace to a water-submerged tank of impervious graphite tubes. The gases leave the cooler at approximately 100 deg. F., the resistance to flow through the system being overcome by a stream evacuator on the absorber vent. Condensate from the cooler is drained to a small condensate tank which is periodically discharged to the 36 percent acid storage tank.

Absorbing The cooled synthesis gases, including hydrogen and other non-condensables, pass to the top of a co-current falling film absorber and thence to a packed impervious graphite tower where vent gases are scrubbed with a 21 percent recycle hydrochloric acid and non-condensables are removed by the evacuator.

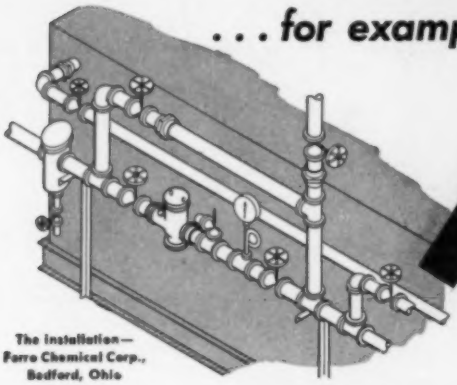
The acid leaving the absorber is adjusted to 36 percent strength and passes by gravity flow to the 36 percent rubber-lined storage tanks. Sufficient acid storage is provided to act as a surge between the burner portion and the stripping portions of the process. This gives flexibility between production rates.

Stripping The 36 percent acid serves as raw material for the stripping column which is constructed of impervious graphite and is provided with a reboiler having impervious graphite tubes. The system operates at 20 psig. It is protected by an explosion disk in the top of the stripper and an air operated pressure relief valve set at 25 psig. The gases leaving the top of the stripper are about 97 percent HCl and 3 percent H_2O. They enter a long vertical condenser the top portion of which is water-cooled; the bottom, brine-cooled. HCl gas and condensate pass downward through this unit and are cooled to 10 deg. F. The cooled condensate (approx. 50 percent HCl under these conditions) is collected separately and periodically sent to 36 percent storage. The HCl gas containing some entrained mist is passed through a brine-jacketed, glass-wool-packed mist trap where entrainment is eliminated. The resultant gas, effectively dehydrated, is available for use at 20 psig. Its quality is consistently 99.5 + percent HCl.

Cooling The stripper bottoms, consisting of 21 percent HCl at 270 deg. F. are cooled in a cascade type impervious graphite cooler and then sent to storage. This acid is recycled as feed to the absorbers where it is concentrated to 36 percent by absorption of HCl from the furnaces.

for outstanding service

on Steam to Drying Ovens . . . for example



The installation—
Ferro Chemical Corp.,
Bedford, Ohio

PROBLEM: To maintain automatically, within close limits, uniform reduced steam pressure from supply line to battery of two drying ovens controlled by individual thermostatic valves.

WORKING CONDITIONS: Initial steam pressure of 70 psi to be reduced to 13 psi, and maintained without significant fluctuation whether one, both, or neither of the ovens is being operated.

SOLUTION TO PROBLEM: One No. 960 Crane Brass Pressure Regulator, properly selected for capacity required, and with adequate condensate drainage provided.

RESULT: For more than 5 years, without interruption and with no more than routine maintenance, the Crane No. 960 Regulator has given complete satisfaction. Operating like new, and since all wearing parts are renewable, it will virtually never wear out. User remarks on unusual simplicity of adjustment.

Another typical case history, demonstrating the bigger value and lower ultimate cost of Crane Quality Valves. And why . . . More CRANE VALVES are used than any other make!

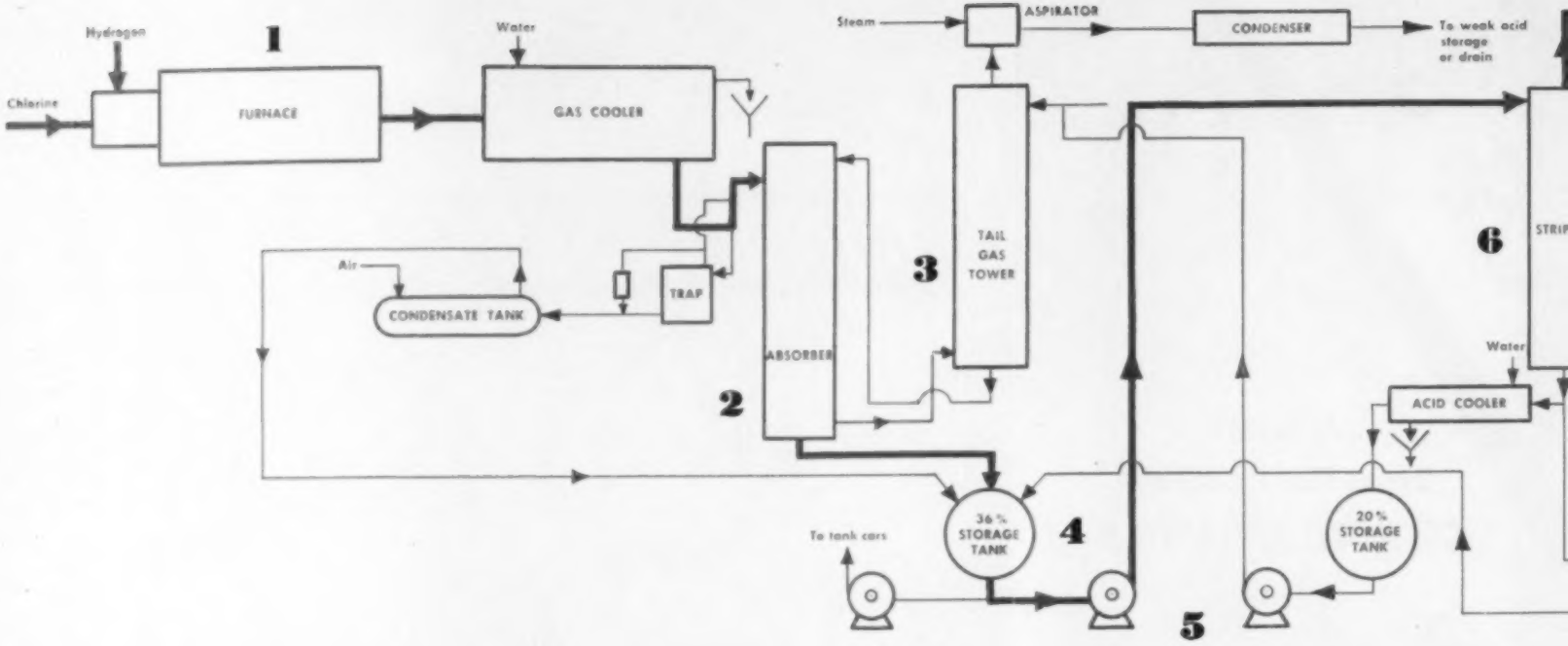
. . . Install Dependable Quality CRANE VALVES

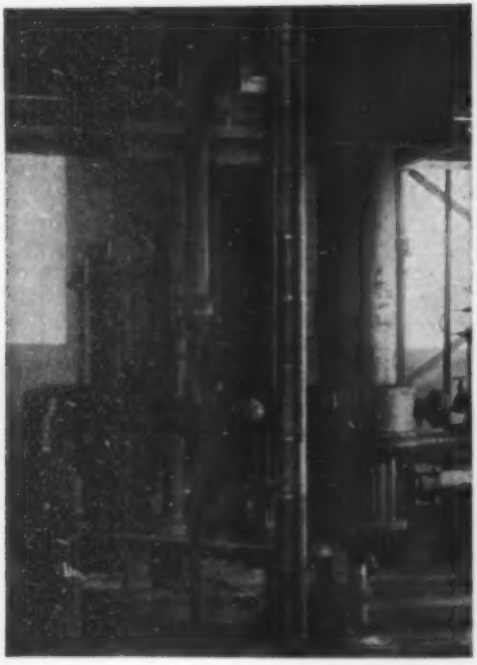
No. 960 Crane Brass Pressure Regulator for steam or air. Literature on request through your Crane Branch or Crane Wholesaler.

CRANE CO.

General Offices:
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING



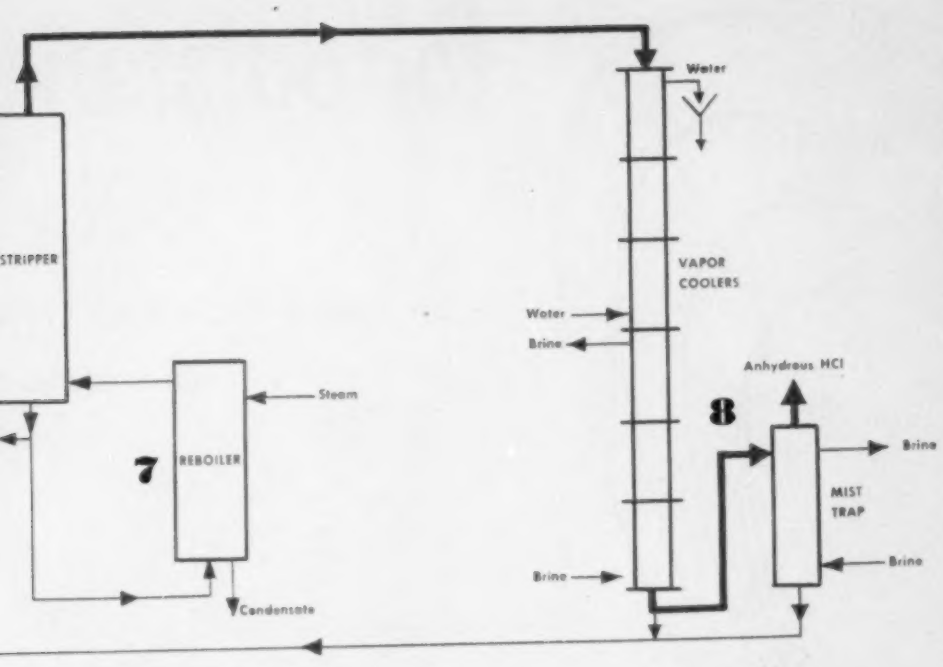


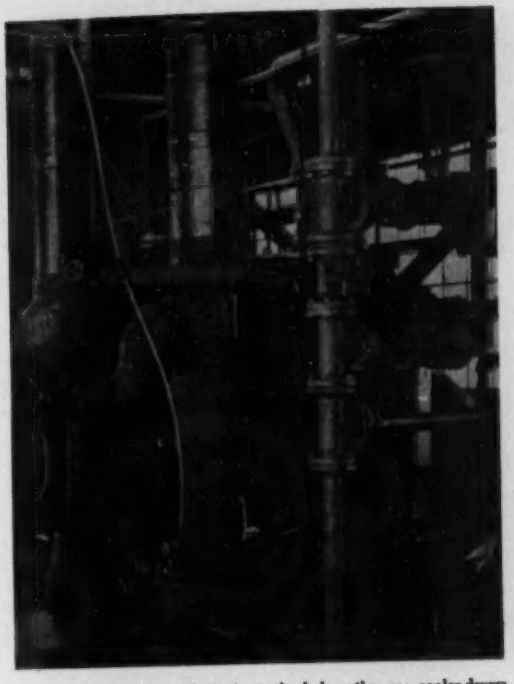
2 This bank of falling film type HCl absorbers handles synthesis gases from the furnace after cooling.

3 Impervious graphite tail-gas scrubbers handle the effluent gases from the falling film absorbers.

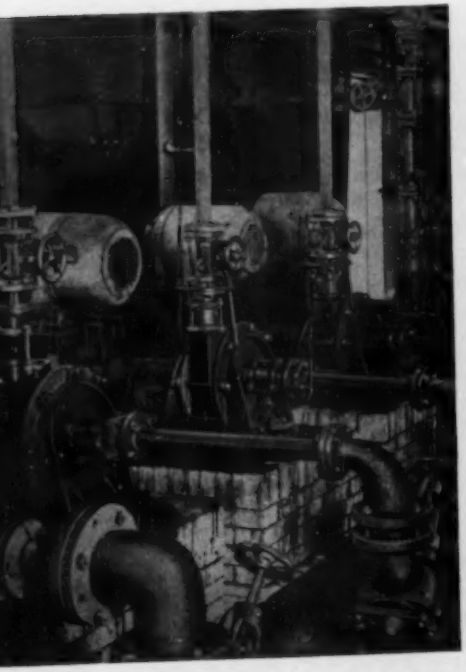
4 This tank farm stores both 36 percent and 20 percent hydrochloric acid. Some 36 percent acid goes to tank cars.

5 In

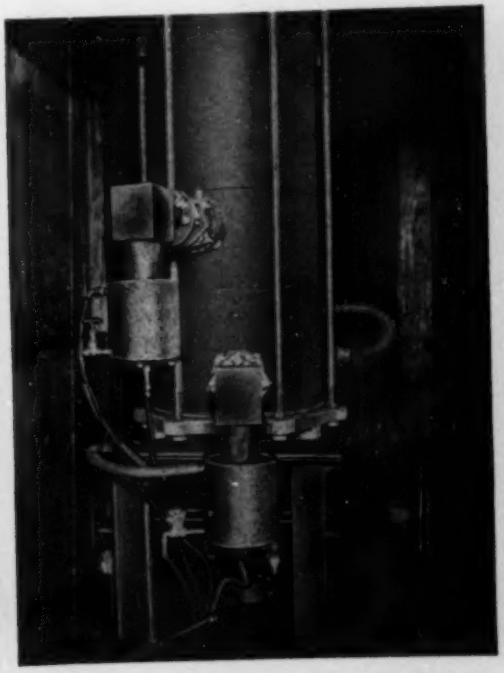




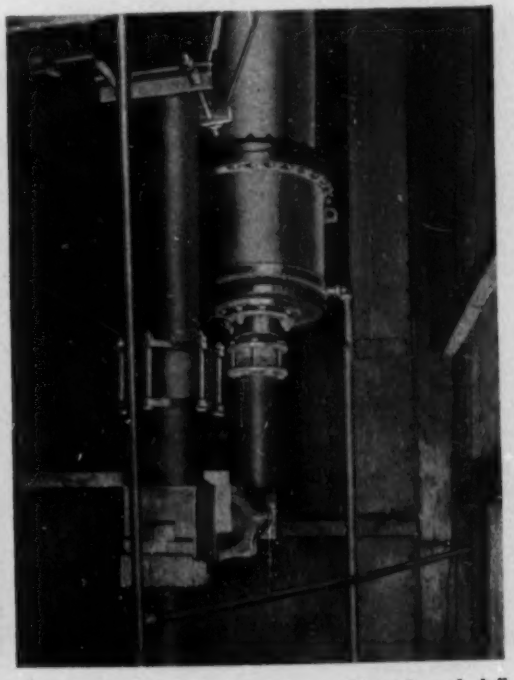
8 Condensate collects in tanks below the gas cooler-dryers and mist traps. Anhydrous HCl gas exits at 20 psig.



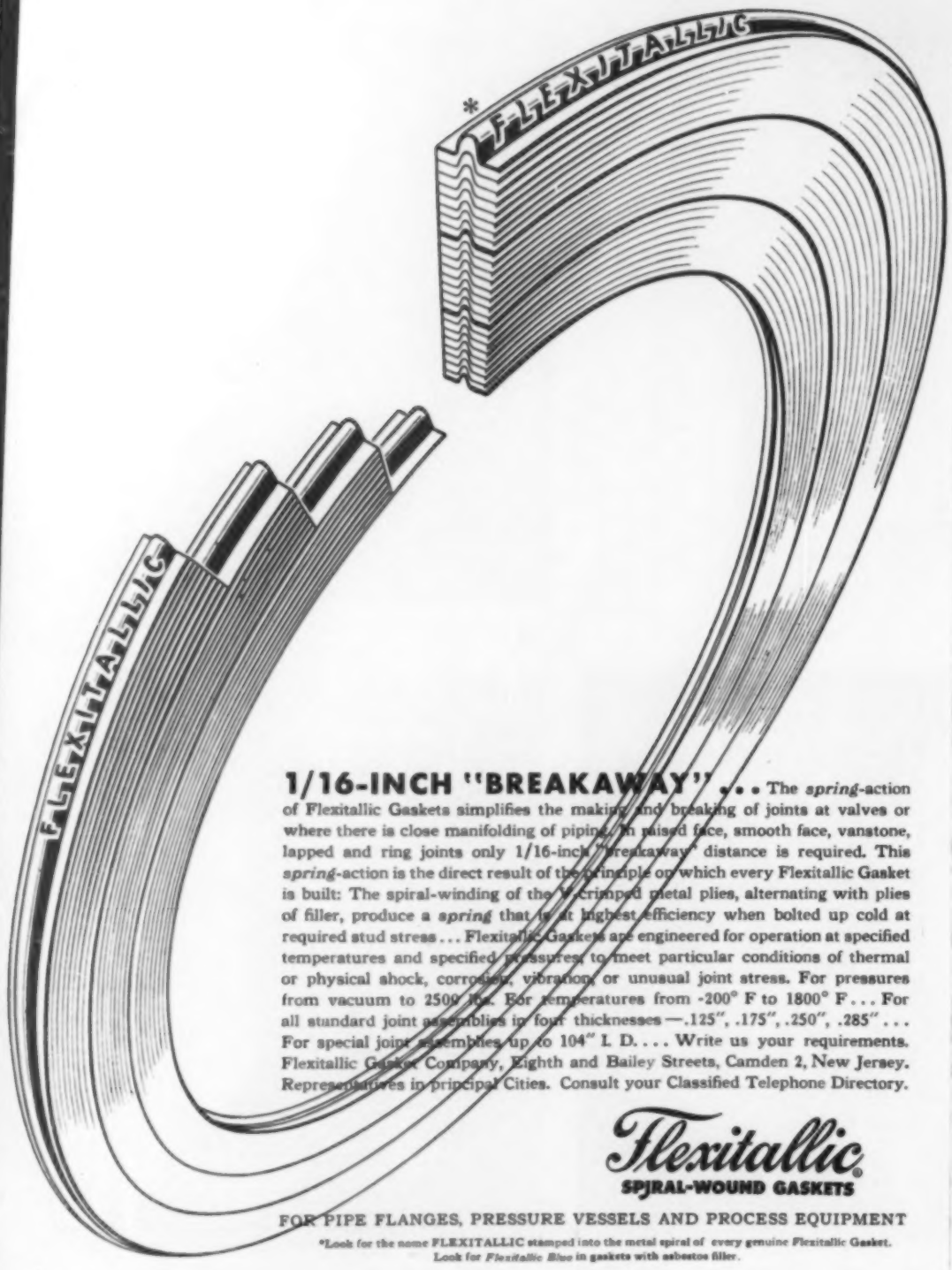
5 Impervious graphite pumps feed 36 percent acid to strippers and 20 percent acid to furnace gas absorbers.



6 Impervious graphite stripping towers. Level sensing devices are located on the bottom of the stripping towers.



7 Steam fed to the impervious graphite tube and shell reboiler provides heat for the stripping operation.



1/16-INCH "BREAKAWAY" . . .

The *spring*-action of Flexitallic Gaskets simplifies the making and breaking of joints at valves or where there is close manifolding of piping. On raised face, smooth face, vanstone, lapped and ring joints only 1/16-inch "breakaway" distance is required. This *spring*-action is the direct result of the principle on which every Flexitallic Gasket is built: The spiral-winding of the V-crimped metal plies, alternating with plies of filler, produce a *spring* that is at highest efficiency when bolted up cold at required stud stress . . . Flexitallic Gaskets are engineered for operation at specified temperatures and specified pressures to meet particular conditions of thermal or physical shock, corrosion, vibration or unusual joint stress. For pressures from vacuum to 2500 lbs. For temperatures from -200° F to 1800° F . . . For all standard joint assemblies in four thicknesses —.125", .175", .250", .285" . . . For special joint assemblies up to 104" I. D. . . . Write us your requirements. Flexitallic Gasket Company, Eighth and Bailey Streets, Camden 2, New Jersey. Representatives in principal Cities. Consult your Classified Telephone Directory.

Flexitallic
SPIRAL-WOUND GASKETS

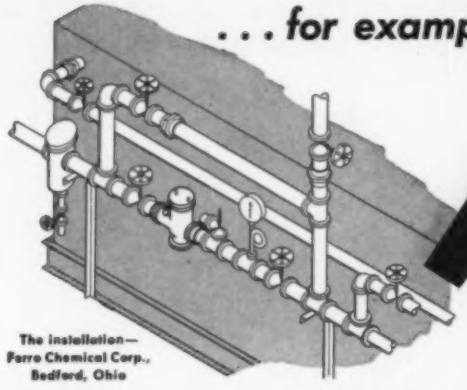
FOR PIPE FLANGES, PRESSURE VESSELS AND PROCESS EQUIPMENT

*Look for the name FLEXITALLIC stamped into the metal spiral of every genuine Flexitallic Gasket. Look for *Flexitallic Blue* in gaskets with asbestos filler.

for outstandi
servic

on Steam to Drying Oven

. . . for example



The installation—
Ferro Chemical Corp.,
Bedford, Ohio

PROBLEM: To maintain automatically, within close limits, uniform reduced steam pressure from supply line to battery of two drying ovens controlled by individual thermostatic valves.

WORKING CONDITIONS: Initial steam pressure of 70 psi to be reduced to 13 psi, and maintained without significant fluctuation whether one, both, or neither of the ovens is being operated.

SOLUTION TO PROBLEM: One No. 960 Crane Brass Pressure Regulator, properly selected for capacity required, and with adequate condensate drainage provided.

RESULT: For more than 5 years, without interruption and with no more than routine maintenance, the Crane No. 960 Regulator has given complete satisfaction. Operating like new, and since all wearing parts are renewable, it will virtually never wear out. User remarks on unusual simplicity of adjustment.

Another typical case history, demonstrating the bigger value and lower ultimate cost of Crane Quality Valves. And why . . .
More CRANE VALVES are used than any other make!

CRANE C

VALVES • FITTINGS • PIPE

ding
ice
ens
le

. . . Install
Dependable Quality
CRANE VALVES

Brass
y re-
ided.
and
No.
erat-
able,
usual

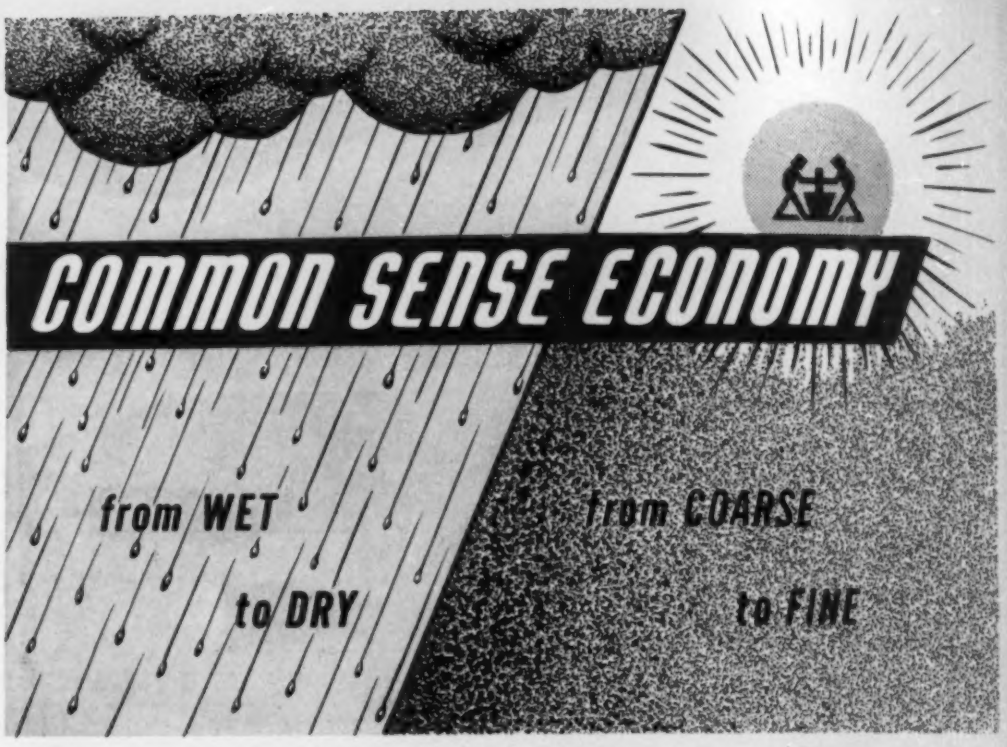
alue
y . . .
ke!

No. 960 Crane Brass Pressure Regulator for steam or air. Literature on request through your Crane Branch or Crane Wholesaler.

CO.

General Offices:
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

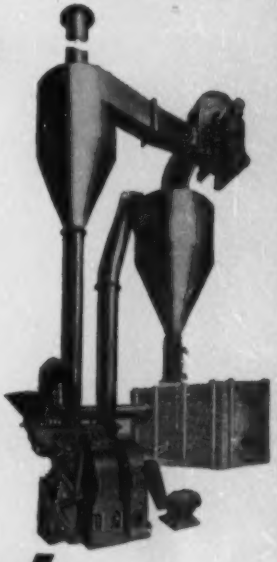
E • PLUMBING • HEATING



2 OPERATIONS with 1 MILL

The Raymond Flash Drying-equipped IMP MILL provides a complete system for producing uniformly ground materials in one continuous process. It offers special advantages in the chemical and food fields for handling products containing surplus moisture. The drying and grinding operations are combined in a single unit of equipment without re-handling the material through separate dryers or conveyors. This method insures a clean, dustless, automatic process and it gives close control over the particle size and moisture content of the finished product.

If you have to meet difficult manufacturing specifications in making powdered foods, chemicals, pigments, filter-cakes and centrifuged products, the Raymond IMP MILL is worth investigating as a modern, low-cost method, proved in many industries.



RAYMOND Imp Mill with Flash Drying Accessories.

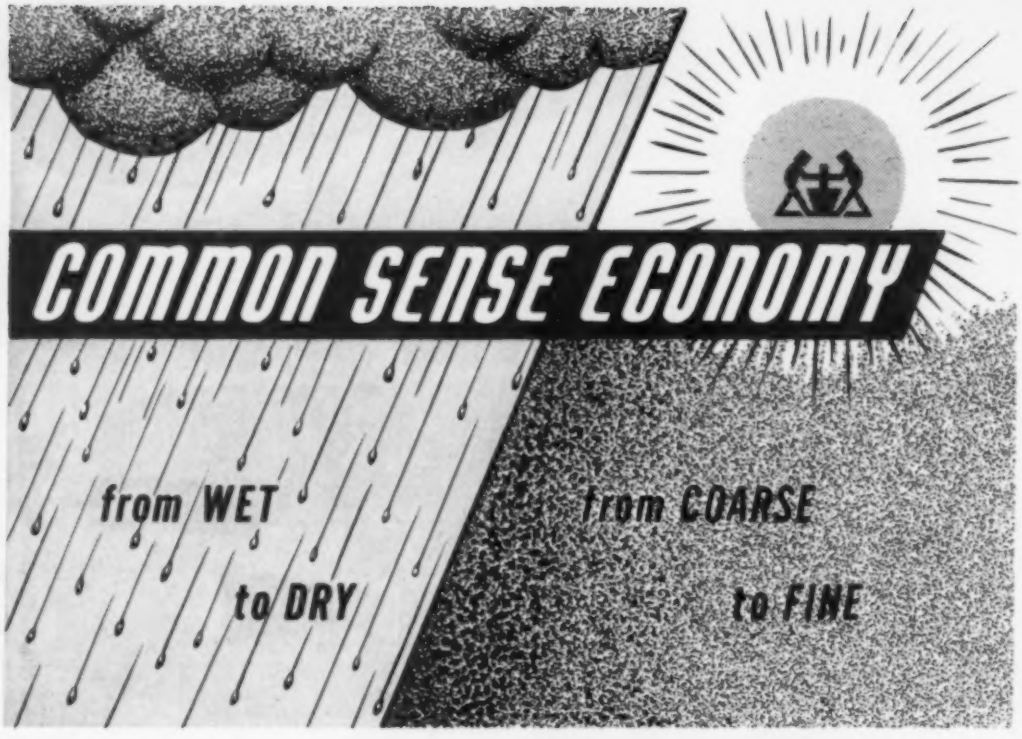
For Details, see Raymond Catalog #67.

COMBUSTION ENGINEERING-SUPERHEATER, INC.

1311 North Branch St.
Chicago 22, Illinois

Raymond
PULVERIZER DIVISION

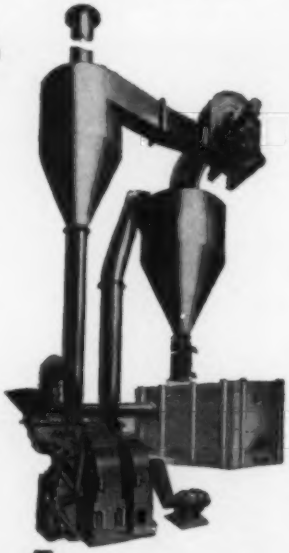
Sales Offices in Principal Cities



2 OPERATIONS with 1 MILL

The Raymond Flash Drying-equipped IMP MILL provides a complete system for producing uniformly ground materials in one continuous process. It offers special advantages in the chemical and food fields for handling products containing surplus moisture. The drying and grinding operations are combined in a single unit of equipment without re-handling the material through separate dryers or conveyors. This method insures a clean, dustless, automatic process and it gives close control over the particle size and moisture content of the finished product.

If you have to meet difficult manufacturing specifications in making powdered foods, chemicals, pigments, filter-cakes and centrifuged products, the Raymond IMP MILL is worth investigating as a modern, low-cost method, proved in many industries.



RAYMOND Imp Mill with Flash Drying Accessories.

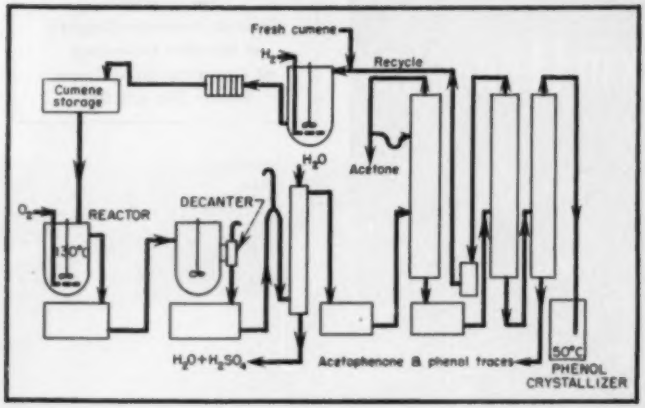
For Details, see Raymond Catalog #67.

COMBUSTION ENGINEERING-SUPERHEATER, INC.

1311 North Branch St.
Chicago 22, Illinois

Raymond
PULVERIZER DIVISION

Sales Offices in Principal Cities



Phenol From Cumene

At a time when chlorine and sulphur are scarce, this new process eliminates chlorination and sulphonation steps from phenol production. Two new plants will use process.

A brace of new plants, one in the United States and the other in Canada, will soon be producing phenol from cumene by a new process. Acetone will be a byproduct.

The process still starts with benzene, as do present commercial processes, but it sidesteps sulphonation and chlorination at a time when sulphur (and hence sulphuric acid) is scarce and chlorine hard to get. The benzene is alkylated with propylene to produce cumene, which is isopropyl benzene; cumene is oxidized to cumene hydroperoxide; this splits up into acetone and phenol.

New Plants: One of the new plants will be built at Philadelphia by Allied's Barrett Division at a cost of $8 million. To produce about 25 million pounds a year, it will treble Barrett's phenol capacity.

In Canada, the other new phenol plant will be erected in Montreal East by British American-Shawinigan Ltd., jointly-owned corporation recently organized by British American Oil Co. and Shawinigan Chemicals Ltd. This plant will produce phenol under Hercules Powder-Distillers Co. patents. When completed in 1953, it will make enough to meet Canada's needs. Canada now makes no synthetic phenol, imports about 6 million pounds a year and could use more.

Synthetic phenol, which comprises 90 percent of total U. S. phenol output, is made from currently scarce benzene. But petroleum refiners are getting into the production of benzene and the expanding steel industry is adding more byproduct coke ovens, so that by the time these two new phenol plants are ready to run the worst of the benzene drought should be over.

Phenol Capacity: Right now, phenol is tight. By year's end, however, new U. S. capacity coming in should add about 25 million pounds to an estimated 1951 production of 335 million pounds of natural and synthetic. Estimated requirements: 375 million pounds, about 75 percent for plastics. By mid-1952 other new facilities will lift total new production over the present rate by 162 million pounds a year. This should meet growing demands.

It's estimated that the new cumene method will produce as much phenol per pound of benzene as the three major processes now in use. Add to that the fact that the process also produces acetone, always in demand, and the new cumene method takes on even greater significance.

In a way, the new process is a war baby. For it's the offspring of two wartime research achievements: (1) a practical process for manufacturing cumene for use in aviation fuel; and (2) the redox system for catalyzing the polymerization of butadiene and styrene during synthetic rubber manufacture by a cumene hydroperoxide catalyst.

Cumene Process: In the new process, cumene is oxidized to form the hydroperoxide. This can be done in such an inert solvent as xylene or toluene. Better still, it can be carried out in an oil-in-water emulsion at elevated temperature, using such an emulsifier as sodium stearate, sodium ricinoleate or sodium lauryl sulphate. For best results, the reaction is stopped when about 25-50 percent complete.

Next, the hydroperoxide is decomposed by boiling it under pressure in the presence of an acid. Sulphuric acid probably works best, but phosphoric, acetic or p-toluene sulphonic acid can be used or even a hydrogen ion exchanger such as a sulphonated phenol-formaldehyde resin. A comparatively strong acid concentration speeds the split-up into acetone and phenol.

Distillation separates the oily part of the reaction product into its components. Acetone passes off overhead, cumene is recycled, and the product phenol cooled and crystallized.

Traces of phenol in the cumene fraction are extracted with aqueous alkali before it is recycled because phenol slows up the initial oxidation to the hydroperoxide. Another troublesome contaminant, methyl styrene, can either be hydrogenated or washed out of the cumene with sulphuric acid or an alkaline permanganate solution. The phenol contaminant, acetophenone, is taken out during distillation.

How It Works: In a typical operation (*see flowsheet*), 68.4 lb. per hr. of cumene is fed into an oxidation vessel, together with 5.17 lb. of oxygen. The temperature in the vessel is kept at 130 deg. C. and mixing speeds the oxidation. Liquid leaving the reactor contains 18.17 lb. of cumene hydroperoxide, besides 52.5 lb. of unchanged cumene.

This liquid is mixed, in a lead-lined stirred vessel, with twice its volume of dilute sulphuric acid. The aqueous phase is separated from the oil phase in a decanter and continuously returned to the reaction vessel. The

(*Continued on page 218*)

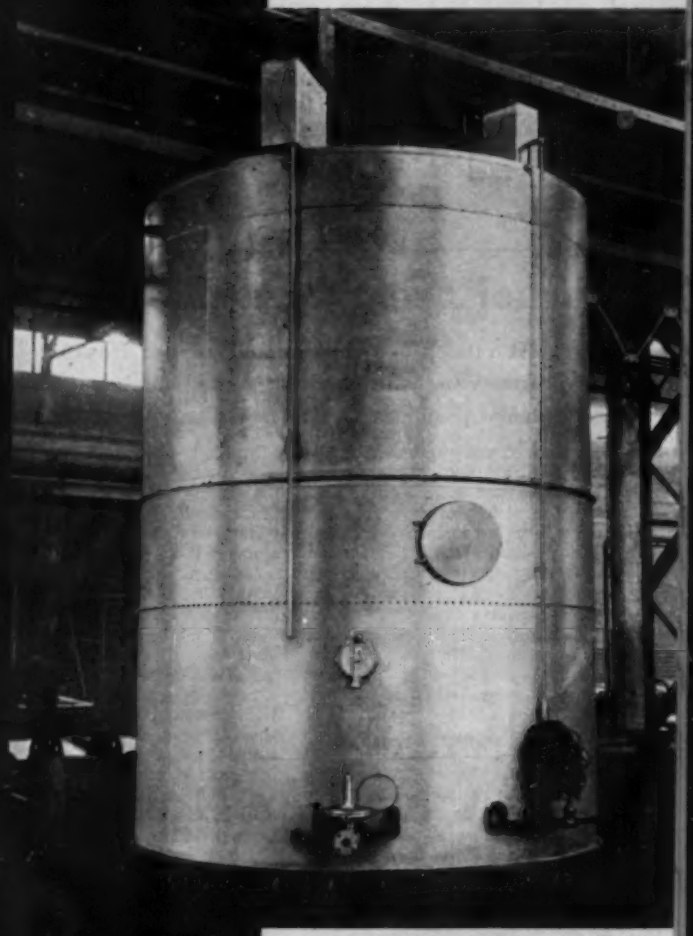
Wiggins Gasholder does 7 years' work in 11 months!

See us at the General American Display at the 23rd Exposition of Chemical Industries, Booths 285 and 287

Pilot gasholder stores coke oven gas for nationally known steel maker. *Dry seal proves thoroughly effective!*

March 13, 1950, a pilot plant test was begun to determine suitability of the Wiggins neoprene dry seal in storing debenzolized coke oven gas. Automatic controls were installed which filled and emptied the gasholder every hour. This was the operation over the first several months. During the remaining period, this cycle was alternately speeded up and slowed down. On February 13, 1951, this Wiggins Gasholder test was completed —after 11 months and 2,650 cycles— roughly equivalent to 7 full years of operation at one cycle per day!

During the entire test period coke oven gas was in continuous *direct contact* with the seal fabric. Temperatures in the gas space ranged from over 100° F. to *below* 0° F. During much of the test, inside surface of seal was wet with condensate. All these combined to give as severe a test as anything that could be expected.



Test Wiggins Gasholder —71' 5" diameter; 16'0" high. Maximum movement of piston—10' 10 11/16".

THESE WERE THE RESULTS:

Air side of *dry seal* in original condition.

Neoprene coating on gas side flexible and resilient—unaffected by chemical action. No hardening or cracking.

All seams gas-tight. NO HARMFUL EFFECTS TO DRY SEAL.

Wiggins is the ONLY gasholder using an *absolutely dry, frictionless seal.* No water, tar or grease. No weather worries, operating costs or maintenance problems. No replacement of sealant. Write for new BULLETIN WG-22 . . . or refer to Builders' Committee Report (May, 1951) American Gas Association.

WIGGINS VAPOR SEALS
GENERAL AMERICAN
TRADE MARK

GENERAL AMERICAN TRANSPORTATION CORPORATION

135 South LaSalle Street, Chicago 90, Illinois

Branch Offices: Buffalo • Cleveland • Dallas • Houston Los Angeles • New Orleans • New York • Pittsburgh San Francisco • Seattle • St. Louis • Tulsa • Washington

Export Dept.: 10 East 49th Street, New York 17, New York

Plants: Birmingham, Ala.; East Chicago, Ind.; Sharon, Pa.

Brown & Root travels in the best of circles

From Goliad to Guam . . . on a multitude of industrial projects you'll find the trade-mark "Brownbilt" . . . a mark which has come to mean "job well done."

In thirty-five years Brown & Root has built a tremendous backlog of satisfied clients . . . clients who have time and again called on Brown & Root to do another job.

Whatever your project, wherever it might be, IF you are looking for the utmost efficiency and economy in design and construction, Brown & Root would like to discuss the subject with you.

BROWN-BILT

BROWN & ROOT, Inc. *Engineers • Constructors*

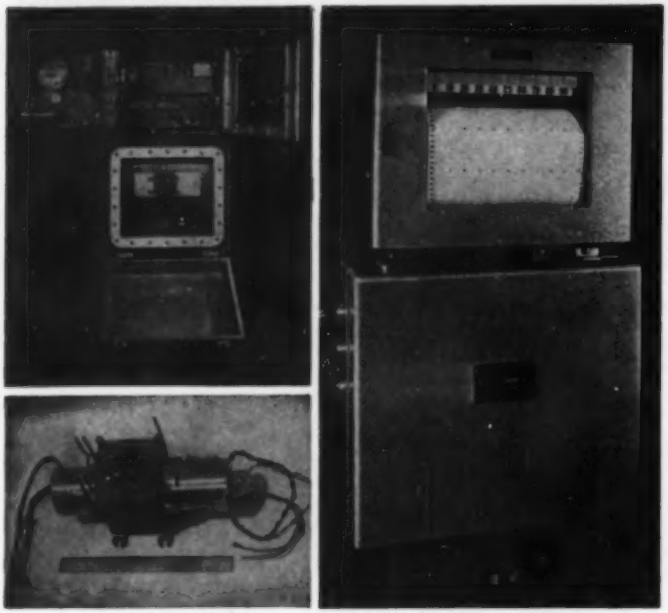
P. O. BOX 3, HOUSTON 1, TEXAS

CABLE ADDRESS — BROWNBILT

Associate Companies:— BROWN ENGINEERING CORP. • BROWN & ROOT MARINE OPERATORS INC.

IMPORTANT CONTRIBUTION
to the control of the process

EXPLOSION-PROOF HOUSING



CONTROL ELEMENT COMPACT, STABLE

Baird Associates

PLANT STREAM ANALYZER, INFRARED ABSORBING TYPE — for the chemical process industries

Quantitative analysis of a single infrared-absorbing component in a stream of gases. For example:

- n-Butane in Methane, Ethane, Propane, Iso-Butane,
- CO, CO_2
- Methane in Natural and Manufactured Gas Blends
- Carbon Dioxide in Expired Air
- Acetylene in 14-component Mixture
- Methane in 14-component Mixture
- Carbon Dioxide in 7-component Mixture
- Hydrogen Cyanide in 8-component Mixture
- Ammonia in 7-component Mixture etc. etc.

Your initial enquiry on the subject should provide brief pertinent information on the nature of your continuous analysis problem. Please address Continuous Analyzer Division, Baird Associates, for application studies as well as Bulletin #36.

Baird Associates, Inc.

33 UNIVERSITY ROAD CAMBRIDGE 38, MASS.

oil phase is pumped into the bottom of a packed column, where it is washed countercurrently with water to remove traces of sulphuric acid.

Crude product mixture, which now contains 10 lb. of phenol and 6 lb. of acetone, as well as 54 lb. of unreacted cumene, together with 6 lb. of acetophenone and 1 lb. of methyl styrene, is pumped into the middle of a still that takes off all the acetone overhead.

Bottoms from this still are fed into a vacuum still. The distillate contains all the unchanged cumene and also methyl styrene. Make-up cumene is added to this recovered cumene. Then, from time to time, batches of it are hydrogenated in the presence of Raney nickel at 100 deg. C. for about 15 to 30 min. to reduce the methyl styrene content to less than 50 ppm. The liquid is decanted from the catalyst and filtered, after which it's ready to be used over.

Another vacuum still gets rid of acetophenone in the product phenol. Bottoms from this phenol still contain about 0.6 lb. of acetophenone and 0.12 lb. of phenol. The product comes off overhead, is condensed at about 50 deg. C. and the liquid phenol crystallizes in a special receiver; 9.8 lb. of phenol of good melting point are obtained per hour.

Versatile Technique: This hydroperoxidation works just as well on other alkyl benzenes in which at least one of the alkyl groups has a tertiary carbon in the alpha position to the benzene ring. Diisopropyl benzene, for example, can be oxidized by this process to both its mono- and di-hydroperoxides.

Adding further to the versatility of the process is the fact that different decomposition agents cause the hydroperoxides formed to break down into different products. For instance, the mono-hydroperoxide of diisopropyl benzene is converted into isopropyl phenol by heating with a mineral acid; into isopropyl acetophenone with aqueous ferrous sulphate; and into diisopropyl benzene monocarbinol with sodium sulphite.

Diisopropyl benzene di-hydroperoxide, on the other hand, forms hydroquinone when heated with mineral acid; diacetyl benzene with aqueous ferrous sulphate; and bis(2-hydroxy propyl-2)-benzene with sodium sulphite. Heating the bis(2-hydroxy propyl-2)-benzene with alkali bisulphate gives bis(alpha-methyl vinyl)-benzene.

Immediate importance of this new process hinges, of course, on production of phenol. But that's only a starter. Real significance is this: here's

a slick new way to hook substituents onto an aromatic ring without chlorinating or sulphonating. And coming at a time when chlorine and sulphur are scarce, that's an achievement.

$18 Million Expansion Planned By International

An estimated $18 million will go to the chopping block in the new expansion program of International Minerals & Chemical Corp. The pieces will be picked up by several International plants.

A Florida plant, which will produce phosphate chemicals and byproduct uranium, will take the biggest chunk, $10 million. The uranium production is part of company research for AEC.

A California plant (San Jose), which makes monosodium glutamate for the food market, will take $4 million for additions and improvements.

A New Mexico (Carlsbad) plant, which makes potash, will take $2 million for expansion needs.

And $1 million will fall to their Chicago research laboratory.

Cortisone Chemist Honored For His Research Work

At Princeton University a $12,500 scholarship has been established in honor of Lewis H. Sarett, 33, the chemist who originally synthesized cortisone (adrenal cortex hormone). A similar scholarship has been set up at Northwestern University.

The Princeton scholarship will be awarded annually to an outstanding senior in the department of chemistry.

Sarett did his undergraduate work at Northwestern, where he made Phi Beta Kappa in 1939; and his graduate work at Princeton. He received his Ph.D. in 1942.

He is now assistant director of organic and biochemical research for Merck & Co., Inc., Rahway, N. J. As a member of Merck's staff in 1944 he synthesized compound E (known since 1949 as cortisone). The process was long and complex; it included the creation of approximately 15 new compounds.

Merck's recently created Directors' Scientific Award made the grant to both schools in recognition of Sarett's work. Similar awards were given to two other Merck scientists: Karl Folkers, for his work in the isolation and characterization of crystalline vitamin B-12; and Max Tishler, for synthesizing hydrocortisone and the 11-hydroxy derivatives of natural steroids.

(Continued)

FOSTER FLOW TUBE*

SHORT... not long!

The picture above sectionalizes one of our standard 12 inch Foster Flow Tubes. Put a rule on it, lengthwise and diametrically. What do you make the length-diameter ratio? About 1½ to 1?

Yes, 1½ to 1 is about the maximum ratio of length to diameter in the Foster Line of Flow Tubes in sizes 3" and above. Some units have less than a 1 to 1 ratio, particularly when high velocities are encountered. What does this mean to you in the way of installation costs and housing? You can readily picture how easy it is to set the Tube in a line. Just like a section of pipe. And with this compactness is an accuracy which not only equals the accuracy of conventional long primary devices but in most cases exceeds it. This is due to the greater pressure differentials for any given main-to-throat reduction.

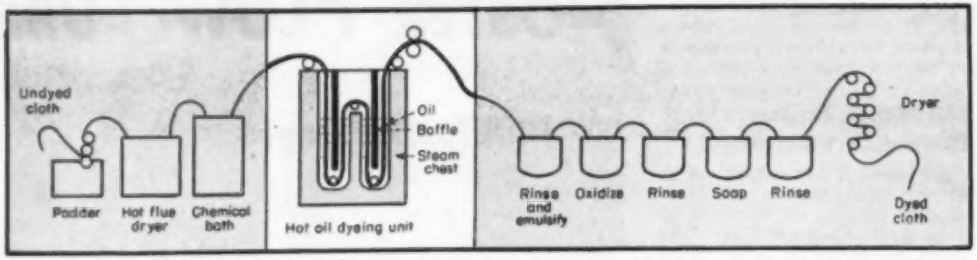
Yes, you get great compactness and ease of installation with the Foster Flow Tube. You also can count on satisfactory accuracy. As for your specific applications, write us in detail giving both processing and installation requirements. Standard sizes come in all commercial pipe diameters, flanged or screwed connections. Standard lining is bronze; other metals to order.

*A Proved Flow Tube Added to Foster Line of Regulating Valves

FOSTER ENGINEERING Company

835 Lehigh Avenue • Union, N. J.

PRESSURE REGULATORS...RELIEF AND BACK PRESSURE VALVES...CUSHION CHECK VALVES...ALTITUDE VALVES...FAN ENGINE REGULATORS...PUMP GOVERNORS...TEMPERATURE REGULATORS...FLOAT AND LEVER BALANCED VALVES... NON-RETURN VALVES...VACUUM REGULATORS OR BREAKERS...STRAINERS...DIKENS...SAFETY VALVES...FLOW TUBES



NEW PROCESS uses oil instead of water or steam, builds higher temperatures; speeds dyeing; gives better final shade.

Hot Oil Dyeing Catches On

Recently developed process—which fixes dyes in a hot oil bath and cuts dyeing time from hours to seconds—is a unique way to obtain and maintain elevated temperatures.

Dyeing industry, like any other industry, believes it has more problems to solve, and more methods to improve, than any other industry. Hot oil dyeing—just nine months old—may give to the dyer, chemist, and chemical engineer a new solution; or at least a new approach to these problems.

"It is not a panacea for all dyehouse problems," explains S. H. Williams, discoverer and southern manager of General Dyestuff Corp. "But the method does give to us, for the first time, a means of working with solutions high above the boiling point of water without resorting to closed mechanisms. Past studies have clearly indicated the value of elevated temperatures in color fixation. Dyeing times have been shortened from hours to seconds when working temperatures range from 240 to 250 deg. F."

Production costs are low and the process has impressed many textile people because of its economy. Economics are not easy to pin-point, since each mill must be considered separately. However some facts are available:

- ▶ It upgrades the quality of the dyed cloth—a factor of considerable economic advantage. Colors generally show a more uniform shade, a truer reflection of color, and an added luster.
- ▶ It speeds up dyeing time as much as 35 percent; thus it increases capacity and output.
- ▶ It cuts down the consumption of dyestuffs by as much as 20 percent through more efficient fixing.

High temperature fixing is the secret. Most dye fixing operations require elevated temperatures. These higher temperatures make possible the reduction of vat colors with caustic soda and sodium hydrosulphite in a matter of seconds. The high temperature of the oil converts the water, which is present in the cloth together with the dye and chemicals, to steam; and thereby carries out the dyeing within the fiber.

Dyeing at elevated temperatures requires careful control. Several procedures, however, are successful: The Dan River process uses a water bath held at 200 deg. F. The pad steam process uses a steam atmosphere. And the Standfast process, an English system, uses a molten metal—such as the alloy woods metal—held at 200-220 deg. F.

Now the Williams hot oil process uses an oil bath maintained at 220-240 deg. F.

Oil is close to an ideal medium for providing elevated temperatures for dye fixing. It can withstand the range necessary for the dyeing. It is not expensive. It can be recovered and re-used. It does not affect the fabric. And it has many advantages in obtaining proper colors.

Theoretically hot oil could process all dyes that are not soluble in oil. Most of the commercial work, however, has been carried out with vat dyes and sulphur dyes. Limited work has been done with direct dyes. In the future other dyes will be studied.

Cotton was the first fabric treated. Varying weights of cotton, from corduroy to broadcloths, have been fixed in hot oil baths. Rayon is next. One New England mill is already processing rayon. Many mills will most likely do the same.

Plans are under way to try the process on other fabrics, both natural and synthetic. Orlon and Dacron are now being tested. "The results so far are promising," Williams claims.

Commercial acceptance has come quickly. The hot oil dyeing process is only nine months old; already well over 30 million yards of fabric have been dyed by the process.

There is a definite trend toward "fast" colors, since their use in fabrics made under the defense program. The hot oil process with its continuous method and effective temperature control is well suited for fast color dyeing.

General Dyestuff believes it has something pretty good. The next few years may prove it.

Southern Alkali Will Expand West Virginia Chlorine Plant

Southern Alkali Corp., a subsidiary of Pittsburgh Plate Glass Co., will expand its chlorine and caustic soda facilities at the Natrium, W. Va., plant.

The building program, which will cost $8.5 million, will include a new cell building for the production of chlorine, and an addition to the caustic soda department. It will be completed in 18 to 20 months.

Power for the new plant will be purchased from a local public utility. Original plans called for the installation of a turbo-generator to supply the additional power. But they have been discarded. Pittsburgh wants production of the vitally needed chlorine to begin at the earliest possible date.

Diamond Alkali Splits Stock; Buys Kolker Chemical Works

Diamond Alkali Co. split its common capital stock on the basis of two shares for one; and bought Kolker Chemical Works, Inc., with 33,500 shares of Diamond stock.

Kolker, with plants at Newark, N. J., and Houston, Tex., makes organic insecticides and agricultural chemicals. Its sales presently are running at a rate of $7 million per year. Diamond, with 12 plants throughout the country, has a current sales rate of $75 million per year.

(Continued)

COMPARE

THIS FEATURE

OF THE HONEYWELL "SERIES 700" VALVE

✻ Compare the Upper Stem Guide of this valve with that of any other wide band proportional type. Look at it closely . . . study it feature by feature.

Then check the other features of the valve . . . the Specially Designed Diaphragm, the One-Piece Bonnet, the Packless Bellows Seal, the Safety Stem Lubricator, the wide variety of discs, the easy reversibility in the field.

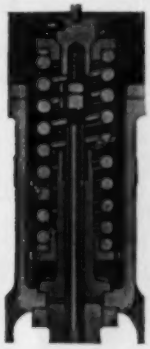
Your comparison will prove that the Honeywell Series 700 has *all* of the features you look for in a fine valve.

It's available in a wide range of styles and sizes. For detailed information, write for a copy of Bulletin 700-3 or call in your local Honeywell engineer . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 1904 Windrim Ave., Philadelphia 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.

New Bulletin 750, "Control Valve Sizing Data," is now available

DUPLEX UPPER STEM GUIDE



Two bearings guide stainless steel upper valve stem. Top bearing is self-oiling; lower bearing is lubricated by an easily accessible grease cup. Continuous lubrication assures almost frictionless super structure responsive to slightest change in signal air pressure.

Specially Designed Neoprene Diaphragm

One-Piece Bonnet

Packless Bellows Seal

Safety Stem Lubricator

Wide Variety of Discs

Reversibility in the Field

MINNEAPOLIS **Honeywell**

Valve Products

CARBON BLACK

COLD RUBBER

Phillips Wins . . .

WHAT: Award for Chemical Engineering Achievement, eleventh one of its kind sponsored by this magazine.

WHY: For development of high abrasion carbon blacks and major contributions to the success of cold rubber.

WHEN: On November 28, while the Chemical Show is in New York, the 1951 Award will be made at the Waldorf.

Two inter-related achievements, vital to the welfare of the United States and to its defense, have won for Phillips Petroleum Co. the 1951 Award for Chemical Engineering Achievement. They are: commercial development since 1948 of high abrasion carbon black and major contributions to the success of cold rubber. Together they have tipped the balance from natural to synthetic rubber for tire treads, thus making the U.S. more nearly self-sufficient in rubber, contributing to the nation's defense and insuring low-cost transportation.

Presentation of the award will be made at a subscription dinner to be held on Wednesday evening, November 28, at the Waldorf-Astoria Hotel in New York.

Alfred H. White, chairman of the Award Committee and professor-emeritus of chemical engineering at the University of Michigan, Ann Arbor, will present the award. The committee is comprised of the 70 senior chemical engineering educators of the United States.

This will be the eleventh time that the award, sponsored by *Chemical Engineering*, has been bestowed upon an organization or group of organizations for an outstanding achievement.

Carbon Black: Since Phillips pioneered production of the first high abrasion furnace black, made by pyrolytically decomposing oil in a reactor of special design, the entire pattern of carbon black production has changed. The industry is moving toward the efficiency of the oil furnace process and the high quality of high abrasion furnace black. Continuing in this field with further strides, Phillips in July 1950 announced experimental production of a new super abrasion furnace black.

The first high abrasion furnace black came at a time when the future of the U.S. synthetic rubber industry was none too certain. Tire makers were looking forward to the postwar return of natural rubber. But advent of the new black had an important bearing on that. GR-S synthetic tire treads containing the new black were equal to or better than natural rubber treads containing the best channel black. When combined with cold rubber, the new furnace black produced treads 30 to 50 percent better than natural rubber treads containing channel black.

The new blacks are produced in the world's biggest carbon black plant near Borger, Tex. Annual production of this plant soon will be over 300 million pounds.

In the short span of seven years, production of the Phillips furnace blacks has climbed from 0 to 13 percent of total carbon black production. In 1950 they accounted for 23 percent of total furnace black and 48 percent of oil furnace black produced.

It's estimated that by the middle of 1952 production of oil furnace black by Phillips and its licensees will be at the rate of over 750 million pounds annually, about 35 or 40 percent of the total U. S. production of carbon black.

Cold Rubber: In cold rubber, Phillips can claim a covey of firsts. Phillips (1) in 1942 designed and in 1944 put into operation the world's first refrigerated synthetic rubber pilot plant; (2) produced the first pilot-plant quantities of cold rubber for testing in tires; (3) developed the "Custom"-type polymerization recipe now extensively used commercially to produce 41 deg. F. cold rubber; (4) first produced experimentally "anti-freeze" cold rubbers at temperatures even as low as 0 deg. F.; (5) first demonstrated that high quality tire treads could be produced from polybutadiene rubber; (6) furnished chemical engineering data for cold rubber production, and in February 1948 helped in the first commercial production of cold rubber at Baton Rouge, La.; (7) introduced such organic initiators as diisopropyl benzene hydroperoxide and tertiary butyl isopropyl benzene hydroperoxide as initiators in cold rubber production; (8) first combined cold rubber with high abrasion furnace black; and (9) first inserted cooling coils directly into reactors to get rid of the heat of polymerization fast enough to cut cold rubber production cycles in half.

Production of cold rubber, in which Phillips participates on a large commercial scale through operation of a government-owned plant near Borger, Tex., has increased to over 300,000 long tons annually, over 40 percent of current 760,000 long tons per year of GR-S production. This proportion is likely to increase to at least 75 percent of GR-S production, which is itself being increased.

It was Phillips engineers who solved many of the problems of large-scale operation, making possible commercial

production of strategically vital cold rubber.

And That's Not All: In addition, Phillips designed and operates a plant making tertiary alkyl mercaptans used to control plasticity during the production of cold rubber. Phillips also designed, built and now operates a government-owned plant at Borger, Tex., which was the first to produce butadiene from n-butane by two-step dehydrogenation. The Phillips furfural extractive distillation process is used to recover and purify butadient in three big government butadiene plants.

Chemical Engineers Galore: Chemical engineers have played a big part in the growth of Phillips from a $3 million organization with 27 employees in 1917 to the whopping corporation with assets of over $700 million and more than 19,500 employees that it is today. Of nearly 2,000 technical employees, 556 or 28 percent are chemical engineers. By 1948 chemical engineering had become so important to the company that Phillips Chemical Co., a wholly-owned subsidiary, was organized. Phillips chemical engineers had vital roles in pushing through to commercial reality both cold rubber and high abrasion furnace black.

Big Cracking Catalyst Plant Will Be Built on Gulf Coast

Taking advantage of the mild climate and the cheap transportation, the Davison Chemical Corp. will build an outdoor type plant, one of the largest catalyst plants in the U. S., on the Calcasieu River, six miles south of Lake Charles, La.

Scheduled for operation early in 1953, the plant will cost about $7 million. It will produce, besides other chemicals, the microspheroidal type of synthetic silica-alumina catalyst.

Key items of equipment are huge stainless steel spray-drying chambers that are used to form catalyst particles.

Commercial Solvents To Make Blood Plasma Substitute

Commercial Solvents Corp. will begin in a few months to produce dextran on a large scale. Dextran is a blood plasma expander.

A new plant in Terre Haute, Ind., will cost the company an estimated $1.5 million. It will make dextran at the rate of a million pints annually.

Commercial Solvents has conducted research on dextran products for the past two and one half years.

(Continued)

THIS PIPING MUST NOT BE SPRUNG···OR IT WILL BIND THE PUMP!
I'M MAKING SURE THE PIPING FITS THE UNION···I'LL PUT THIS SUPPORT UNDER THE PIPE TOO!
No. 3 OF A SERIES

HOW TO GET THE MOST WORK OUT OF YOUR VIKING PUMPS

In making suction and discharge pipe connections on a Viking Rotary Pump be sure that no strain is imposed on the pump casing by the pipe. Properly installed, the shaft of a Viking pump should turn easily by hand. If this is not possible you have either sprung the pump in making the pipe connections or with the foundation bolts.

For valuable help in installing, operating and maintaining your pumps, write today for your FREE copy of the Viking Service Manual C. It's a handy, illustrated booklet filled with practical information. Get EXTRA wear out of your pumps by giving them EXTRA care. The Viking Service Manual C tells you how.

Viking PUMP COMPANY Cedar Falls, Iowa

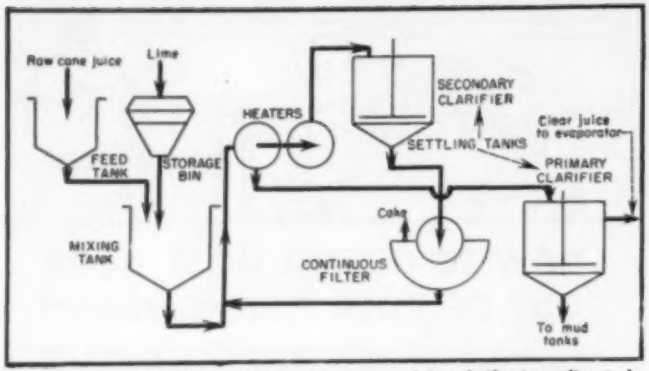
FILTER CLOTH *FOR ALL PURPOSES*

ALKALI RESISTANT • ACIDPROOF • HEAT RESISTANT

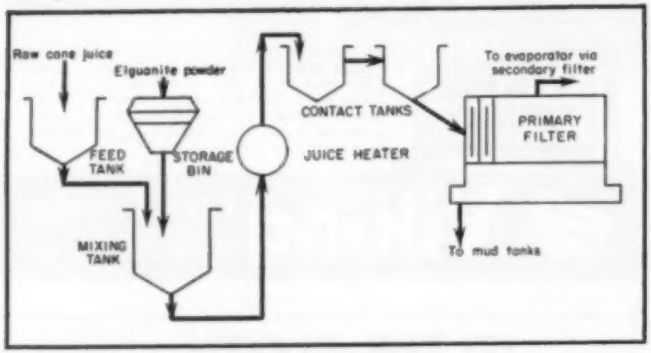
Press sacks, tubes, discs, rotary covers,
CENTRIFUGAL LINERS, AND DUST ARRESTING BAGS, ETC.
WOVEN GLASS & "DURAKLAD" PLASTIC CLOTHS
VINYON - NYLON - SARAN - ORLON
Filter Paper for Plate and Frame Presses
Write for Samples. State Width, Style of Press.

Wm. W. STANLEY CO., Inc.
401 BROADWAY NEW YORK CITY
Factories: NEW YORK & VICTOR, N. Y.

TANKOMETER ANY LIQUID
FOR MEASURING TANK CONTENTS ANY DISTANCE AWAY
Uehling INSTRUMENT CO.
491 GETTY AVENUE • PATERSON, N. J.
SEND FOR BULLETIN 945



OLD process uses lime to remove impurities in sugar juice, clarifies in settling tanks.



NEW process uses Elguanite powder to remove impurities, clarifies juice with filters.

Sugar Takes a Giant Step

First big change in sugar clarification since the 17th century stirs up interest from Pakistan to Florida. Many mills have made investigations and may convert soon.

For the first time since lime was shovelled into a vat of cane juice—266 years ago—a new process, developed by the Elguanite Corp., New York City, offers a basic change in the processing of raw sugar. The result: a product of high quality and higher purity; and at a lower production cost.

At the heart of this process is a new powder defecant that precipitates dissolved organic and mineral impurities in cane juice. Lime forms a slimy precipitate that cannot be filtered; this powder, Elguanite, creates a fast filtering precipitate; and a filtrate that is clear and light. The processing of cane juice—from mills to evaporators—which formerly took hours, now takes 45 min.; and with a rise in purity.

When sugar cane comes from the field, it is first cut, and then crushed. The juice squeezed from the cane is strained. However, fine particles of dirt, colloidal soil and cane fiber cloud the juice. Along with this suspended matter, the juice contains soluble impurities: albumins, gums, pectins, and varying proportions of waxes.

By a process of clarification or defecation, the soluble impurities are removed from the juice. A defecant is added to precipitate these impurities. The suspended matter is entrapped by the precipitate formed.

An Old Problem: Lime has been universally used as a defecant since 1685. However it never was an ideal agent. It forms a gelatinous precipitate that takes some 2 to 5 hr. to settle. As a result cane crushing and everything else slows down.

Suspended solids in the raw juice cause this delay. These solids, particularly fine soil, are difficult to settle. Today the problem is more serious.

Modern harvesting methods have increased the amount of dirt and foreign material in the juice. In many parts of the world, notably Hawaii, bulldozers harvest the sugar; and mechanical loaders handle it. The result is time added to the already long clarification period.

A New Solution: Elguanite Corp. has conducted a research program for the last 10 years hoping to develop some better means of clarification that would speed things up. They have been working principally on an improved defecant.

A happy ending to their story is the new powder compound, Elguanite. This dry white powder is made up from specially processed alkaline earth metals (the principal one, magnesium) in the form of carbonates, hydroxides and oxides. Each of the chemical constituents was picked to react with the 20-odd impurities of raw cane juice.

A Better Process: Powder-processed sugar gives an improved product to the refineries. It removes a high percentage of soluble impurities. It removes from 20 to 30 percent of the ash in the raw juice. And yields are up from 5 to 8 percent.

The purity and quality of the sugar represents such an improvement that, when the market conditions permit, it is practical to make a 98.5 to 99.2 deg. raw sugar; and on a first strike. This means a reduction in shipping costs, since sugar mills would ship on extra ton or more of sucrose to market for every 100 tons of product shipped.

The new process speeds up production. Full-capacity operation is now possible because of faster clarification. This also means increased efficiency. A faster operation eliminates acid inversion and prevents sucrose loss.

It has cut labor costs. Scale formations can now be easily removed without the use of caustic soda. Less scale is formed in the evaporators; and most of the scale formed is soft and friable.

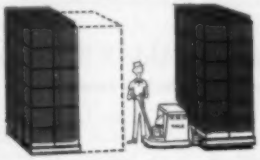
First plant to install the new clarification system was the Grove Farm Co.'s Koloa Mill, Hawaii. Manufacture started in March 1950. The successful operation of this mill has caught the interest of sugar companies all over the world. Elguanite Corp. has received inquiries from

(Continued)

SQUEEZE PLAYS... *that save ... you money!*

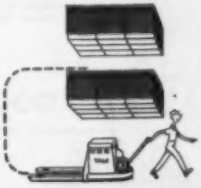
SAVE SPACE!

Thousands of square feet of it in aisles alone! Yale's Worksaver needs less room to work in so you gain valuable extra space for storage and production.*



**SAVE TIME!*

You can quickly work heavy loads with this shorter, lighter, more maneuverable Worksaver, cut costs on jobs bigger trucks can't get at.



SAVE MANPOWER!

One man at the steering handle can free an entire gang from the "sweat, strain and sprain" of heavy hand lifting.

"WALK IT OR RIDE IT!"

*Consider this saving before building new facilities.

Eliminate waste on hard-to-get-at jobs with these YALE WORKSAVERS

SAVE SAVE SAVE—that's the story of YALE'S Stubby Worksaver!

These pallet or platform trucks squeeze into small spaces to do big moving and lifting jobs... open up whole new areas of your plant to faster, more efficient materials handling... *cut your time and labor costs as much as 75%!*

The Yale Worksaver is a rugged trouble-free truck, too! A powerful electric drive unit, hydraulic lift and welded steel frame keep it on the job for years with a minimum of servicing.

Here's another YALE "expert" at cutting your costs

YALE EASY-LIFT HAND TRUCK

... Use it for short hauls, or in combination with Yale power trucks. YALE Easy-Lift makes it a cinch to lift and move heavy loads. It's light, maneuverable, sturdily constructed.

Send this coupon today!

YALE & TOWNE

The Yale & Towne Manufacturing Co., Philadelphia 15, Pa.

THE YALE & TOWNE MANUFACTURING CO., Dept. 4410
Roosevelt Boulevard & Haldeman Avenue, Philadelphia 15, Pa.

I am interested in cutting my materials handling costs.

_____ *Please send me free "Worksaver" literature.*

_____ *Please send me free literature on Hand Trucks.*

Name _____

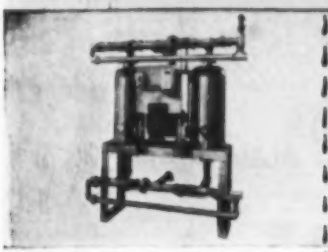
Company _____

Street _____ City _____ State _____

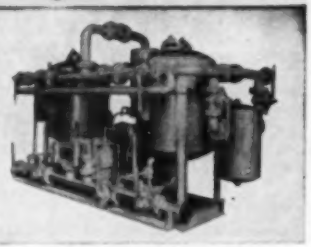
In Canada write The Yale & Towne Mfg. Co., St. Catharines, Ontario.

YALE is the registered trademark of The Yale & Towne Manufacturing Co.

Standard or Special...

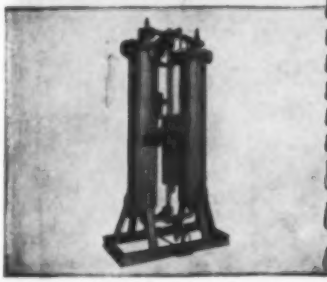


This Kemp Radiation-Cooled Dryer gives maximum efficiency with minimum maintenance and operating costs. Heating period terminates automatically. Rated: 300 scfm, 100 psig, 70° F.

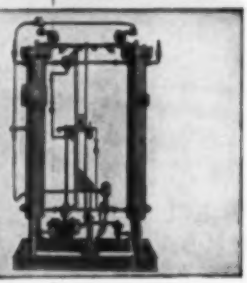


This electrically activated Kemp Dryer is designed so gas stream is not contaminated by oil normally used for reactivation. Rated: 3300 scfm, 100 psig, 70° F.

KEMP can Solve...



This Semi-automatic Kemp Dried Dryer dries air for actuating tools, valves, etc.—dries process air and gases. Rated: 600 scfm, 100 psig, 70° F.



This Kemp Dried Dryer is controlled by program timer. All operations, including tower reversals, fully automatic. Rated: 100 scfm, 100 psig, 70°F.

Your Moisture Problem

DRIES AIR, GASES or LIQUIDS TO NEW LOW DEW POINTS FOR AS LITTLE AS ¼c PER MCF

Whatever you pay for drying air, gases or liquids, check on the economy of Kemp Dynamic Dryers! Hundreds of Kemp Dynamic Dryers control moisture at low cost in plants all over the country. Operation is guaranteed to your specifications. In fact, many Kemp users report drying to sub-zero dew points for as little as ¼c per mcf—including all charges for labor, capital investment and materials!

Flexible Design

Kemp Dynamic Dryers are versatile — offer manual, semi-automatic or automatic operation. Desiccant is especially selected and compounded for the type drying you require. With Kemp you can dry air, gases or liquids, eliminate moisture in materials, and control humidity in large or small areas. Gas, electric or steam regeneration is supplied as standard equipment.

Find out how Kemp engineering can save you money!

KEMP OF BALTIMORE **DYNAMIC DRYERS**

Write For Bulletin D-27 for technical information. Address: C. M. KEMP MFG. CO., 405 E. Oliver St., Baltimore 2, Md.

CARBURETORS • BURNERS • FIRE CHECKS • ATMOSPHERE & INERT GAS GENERATORS
ADSORPTIVE DRYERS • METAL MELTING UNITS • ENGINEERING EQUIPMENT • SPECIAL EQUIPMENT

Mexico, Cuba, Puerto Rico, the Philippines, Pakistan, Hyderabad, Egypt, Brazil, Venezuela, and Uruguay. Several mills will be converted shortly in Hawaii. A plant in the Philippines started operations this year.

In the U. S., Florida raw sugar mills may soon adopt the process. Refineries are also interested. At this time a California company is processing with Elguanite in the manufacture of soft sugars.

Next to a new way nothing advances an industry like a better way. There seems to be little doubt that sugar has taken at least one giant-step.

Union Carbide Will Produce New Synthetic Insecticide

Carbide & Carbon Chemicals Co. will build a $5 million to $6 million plant in West Virginia to produce allethrin, a new synthetic bug killer.

Allethrin is used in household and dairy insect sprays, and aerosol bombs. It kills flies, mosquitoes, gnats, roaches, silverfish, water bugs and ants.

Allethrin will replace pyrethrins as a quick knockdown and killing agent used in insect sprays. It has a number of advantages over pyrethrins:

- It costs less: Pyrethrins are natural products, imported chiefly from Africa.
- It has greater stability. Hence, its killing action persists longer.
- Aerosol formulas can be prepared with it that are practically odorless.
- It contains no natural tars to clog spraying nozzles.

Research will be intensified now that there is assurance of an adequate supply.

Celanese Will Step Up Its Paraformaldehyde Capacity

Celanese Corp. of America has launched a $3.4 million expansion at its Chemcel plant at Bishop, Tex. The government has granted Celanese a 65 percent tax writeoff on the new construction. A large paraformaldehyde plant will be erected. In addition, capacity for turning out Formcel and trioxane will be increased.

Demand for paraformaldehyde has outstripped the capacity of the pilot plant that Celanese has been running at Bishop. This solid form of formaldehyde is used widely in industry wherever a very active, almost anhydrous formaldehyde is needed. Defense end uses of paraformaldehyde are critical; what's more, the military are keeping some new developments

under wraps that will further broaden demand for a solid formaldehyde.

Formcel is an alcohol solution of formaldehyde. Trioxane is a pellet-like fuel that burns without visible flame and is in demand by the military services.

Diamond Alkali Makes Plans To Modernize Its Ohio Plant

A two-year expansion program will take place at the Painesville, Ohio, plant of the Diamond Alkali Co.

Present facilities will be enlarged and modernized. The company will switch from the traditional lime-soda to the electrolytic process of producing caustic. Result: it will double its production of caustic.

The chlorine co-product will be put to work. The program also includes the construction of a new perchloroethylene plant. Diamond has the practical experience: it has produced perchloroethylene on a limited scale since 1948 at its electrolytic chlorine-caustic soda plant in Houston, Tex.

(Continued)

CONVENTION CALENDAR

Association of Consulting Chemists & Chemical Engineers, annual meeting, Shelburne Hotel, New York, October 23.

National Paint, Varnish & Lacquer Association, Chalfonte-Haddon Hall, Atlantic City, October 29-31.

National Pest Control Association, annual meeting, Statler Hotel, Boston, October 29-31.

Federation of Paint & Varnish Production Clubs, annual meeting, Chalfonte-Haddon Hall, Atlantic City, November 1-3.

American Petroleum Institute, annual meeting, Chicago, November 5-8.

American Drug Manufacturers Association, Production and Engineering Section, Waldorf-Astoria Hotel, New York, November 8-9.

American Council of Commercial Laboratories, Ambassador Hotel and Baker Hotel, Dallas, Tex., November 15-16.

23rd Exposition of Chemical Industries, Grand Central Palace, New York, November 26-December 1.

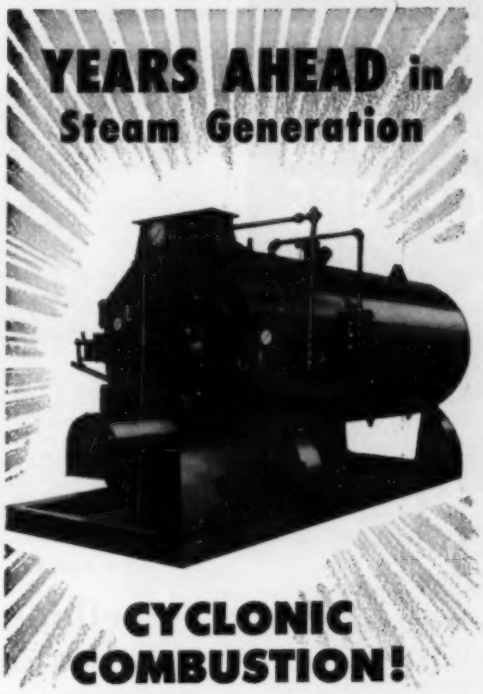
Chemical Specialties Manufacturers Association, annual meeting, Mayflower Hotel, Washington, D. C., December 2-4.

American Institute of Chemical Engineers, annual meeting, Chalfonte-Haddon Hall, Atlantic City, December 2-5.

Synthetic Organic Chemical Manufacturers Association, annual meeting, Commodore Hotel, New York, December 11.

Manufacturing Chemists' Association, semi-annual meeting, Waldorf-Astoria Hotel, New York, December 13.

American Chemical Society, Division of Industrial and Engineering Chemistry, symposium on nucleation, Northwestern University, Evanston, Ill., December 27-28.



The slogan "Years Ahead in Steam Generation" is *Not* just an advertising phrase but is a statement of fact.

The truly amazing method of Cyclonic combustion has been proven successful by U. S. Industry and again by the Armed Services.

Full power operation from a cold start in 15 to 20 minutes. Savings up to 50% on maintenance. Great fuel operational savings.

Details of these and many other facts regarding Cyclotherm generators are available by writing Dept. E.

Boilers are designed for oil or gas operations from 18 thru 500 h.p., 15 to 200 lbs. operating pressure.

see our CATALOG in SWEET'S FILE ARCHITECTURAL

CYCLOTHERM
STEAM GENERATORS
OSWEGO, NEW YORK

FOR WEIGHING CONTENTS OF TANKS and HOPPERS

Manufactured to special size—for your tank or hopper—vertical or horizontal

WINSLOW 150,000 LB. TANK SCALE

Can be furnished for use with cone shape or flat bottom tanks—with either direct reading weigh beam or ticket printing weigh beam. Ticket printing beam prints weights with 5 lb. or 10 lb. minimum graduation.

TYPE "A" RECORDING BEAM

This weighing equipment is in use by large and small industrial plants—throughout the United States—and specified by some of the country's largest consulting and construction engineering concerns.

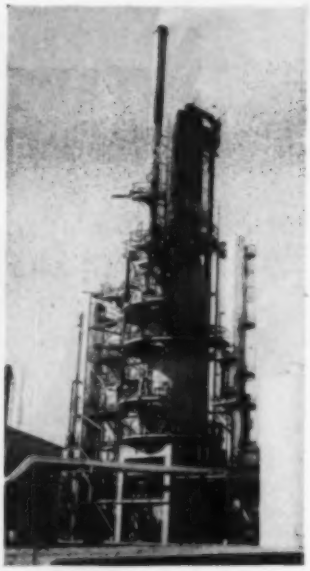
Write for further information.

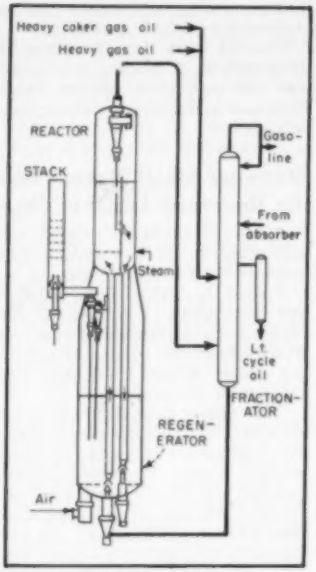
Winslow— tank scales

Manufactured by

WINSLOW SCALE COMPANY

No. 25th Street • Terre Haute, Indiana





Orthoflow: one vessel houses reaction, regeneration, and stripping chambers.

Something New in Cat Crackers

First Orthoflow fluid catalytic cracker, recently put on stream in Canada, has many interesting construction features. New design cuts maintenance and investment costs.

Other fluid crackers engineered by M. W. Kellogg Co., New York City, are larger than the new cracker of the British American Oil Co., Ltd., at Edmonton, Can. This Orthoflow will process only 2,000 bbl per day. But Orthoflow design is not restricted to small throughput.

Kellogg has plans for bigger doings. It is currently building two more plants with capacities of over 8,000 bbl. per day. And it has designed, for purposes of study and cost comparison, units capable of processing more than 60,000 bbl. per day.

The Edmonton plant has several interesting design innovations:

- Straight line catalyst carrier lines are within the vessel. These lines will be less subject to erosion by high velocity catalyst than bent lines.
- Expansion joints are eliminated in the lines. This means economy and low maintenance.
- Control valves for the catalyst and oil flow are spring loaded, and specially designed to absorb the natural thermal expansion of the carrier lines. They are large needle valves through which catalyst and oil are introduced to the carrier line leading to the reactor. Hot catalyst from the bottom of the regenerator is drawn into the line by the pressure drop created by high velocity oil passing through the valve.
- Supporting structure for the reactor and regenerator is eliminated. There is a saving in steel, and overall space.
- Control points, particularly the valves for control of catalyst flow, although normally automatic, are low enough to be easily reached by operating and maintenance crews.

Kellogg, it seems, has consciously sought to lower investment and maintenance cost by improved design.

Detergent Plant To Be Built By General Aniline & Film

Detergents will be manufactured by General Aniline & Film Corp. at its newly proposed plant. The plant will be built at Doe Run, Meade County, Ky.

Raw materials will be acquired as the result of an agreement with the Mathieson Hydrocarbon Chemical Corp. that has recently completed a plant at Doe Run.

Process improvements, notably continuous operation, will be used in the new plant. *(Continued)*

DO YOU REALLY KNOW WHAT MULLING IS?

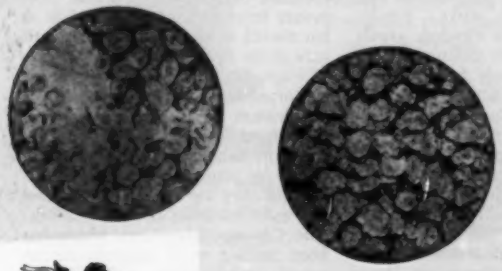
WATCH the practiced technique of a chemist's mortar and pestle—the intensive smearing and rubbing actions—and basically *THAT'S MULLING.* Nothing compares with it in uniformly blending dry, semi-dry or pasty materials.

That's why Simpson Mix-Mullers have proved superior in the Chemical Process Industries. By combining the chemist's mulling action with *large capacity, accuracy, speed* and *uniformity,* Simpson Mix-Mullers are able to meet every production requirement for blending dry, semi-dry or pasty materials. Thousands of installations offer positive proof of superior mixing results.

Mulling with a Simpson Mix-Muller utilizes a special pair of revolving mullers and plows mounted on a stationary pan. The mullers are adjustable and are supported by rocker arms so that they can be free to ride on the material, creating a true mulling action as they revolve. This eliminates all balling of material and quickly develops a maximum plasticity of the mix.

. . . what SIMPSON Mix-Mullers can do for your process . . .

You need only to look at the two photomicrographs below to realize the superiority of mulling in a Simpson Mix-Muller. At the left is result of using an ordinary paddle type mixer (note smear of unmixed material) — at the right the obviously finer, uniform results of using a Simpson Mix-Muller.



View of laboratory size Simpson Mix-Muller with crib removed to show action of mullers. Note mulled path in material.

Here is why SIMPSON Mix-Mullers are used throughout the Chemical Process Industries:

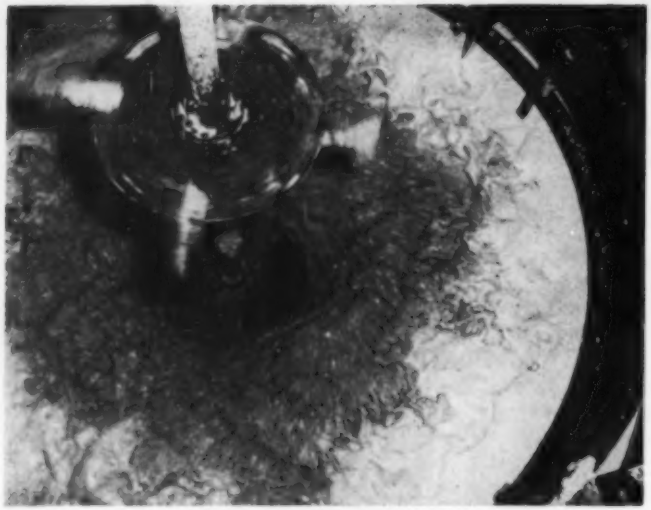
- GREATER PRODUCT UNIFORMITY
- FASTER MIXING CYCLE
- LOWER COST PER TON OF MATERIAL
- LESS LABOR REQUIRED
- LESS HORSEPOWER REQUIRED
- SAFER OPERATION

Simpson Mix-Mullers are built in capacities from 1/10 to 30 cu. ft. They may be specially equipped for heating and cooling while mixing—for mulling under vacuum or pressure—for corrosive materials—or to function as a reaction vessel.

FOR PROOF of the ability of Simpson Mix-Mullers to do a better job in mulling your material, our complete laboratory facilities are available without obligation . . . and if your material can't be successfully mulled, we'll tell you why. *Write for complete details.*

SIMPSON **Mix-Muller® Division**

NATIONAL ENGINEERING CO. 604 Machinery Hall Bldg., Chicago 6, Ill.



Napalm for Korea

New fully automatic plant of Ferro produces it for use in jellied gasoline bombs. Ferro has a fat contract now, can switch later to making other metallic soaps.

Napalm, used to jelly gasoline for fire bombs and flame throwers, is now being turned out in the new $300,000 plant of Ferro Chemical Corp. in Cleveland, Ohio. Fully automatic, the plant has a capacity of 1 million pounds a month, can easily exceed that by 25 percent. First used in World War II, jellied gasoline has come into its own in Korea.

The government has just awarded Ferro a contract for 3.5 million pounds of napalm to be delivered before the end of this year. Ferro expects to meet this contract with ease.

Napalm now costs the government 40 c. a lb., down 58 c. from its World War II price and 25 c. less than the bid price at the beginning of this year. The sudden tumble in price came when Ferro put its fully automatic plant on stream.

No newcomers to napalm production (Ferro made as much as 200,000 pounds a month of the stuff in a hastily rigged up plant during World War II), Ferro engineers put plenty of savvy into the design of their fully automatic plant. They have adapted more or less standard plant equipment to an in-line mass production system that pays off in lower operating costs. Centrifugal extractors replace filter presses, a continuous rotary dryer takes the place of a tray type oven dryer, raw materials are handled and measured automatically, and the final blending and packaging are done accurately by mechanical means.

Four steps, each completely automatic, are required to make napalm. First, naphthenic, oleic and coconut fatty acids are metered into a mixing tank and caustic soda added to produce the sodium soap. Next, an alum solution is made up. Then, the alum is carefully run into the sodium soap to form the napalm "strike." Finally, the dried napalm is blended, usually with Santocel. After milling, the finished product is ready for packaging.

Ferro packs the napalm in 150-lb. sealed drums, or runs it through a packaging machine that turns out 500 of the 5½-lb. cans per hour.

While the new plant was built to make napalm and is making it right now, enough flexibility was designed into it so that it can quickly shift to production of other metallic soaps if, and when, napalm is no longer needed.

Unique features of the installation, according to Ferro Chemical, are the mechanical proportioner, the centrifuge that replaced the filter box, and the rotary continuous dryer that replaced the oven tray dryer.

American Cyanamid's Plant Makes Cracking Catalysts

American Cyanamid Co. will make synthetic cracking catalysts in its new $3 million plant in Michigan City, Ind.

The plant, first of its kind built since 1942, will supply catalysts for oil refiners throughout the Midwest and along the Atlantic seaboard. Cyanamid operates a similar plant in Fort Worth, Tex.

Part of the installation is a spray dryer, believed to be the largest of its kind in the world.

New Pulp Mill Will Evaporate Much of Its Waste Liquors

Construction has begun at the bleach-kraft pulp mill of Weyerhaeuser Timber Co. at Everett, Wash. Estimated to cost $20 million, the plant will have a capacity of 250 tons daily, will use Douglas fir sawmill waste from an adjacent Weyerhaeuser sawmill.

Much of the waste liquors from the new plant will be evaporated. Other liquors will be carried out into the deep waters of Port Gardner Bay to avoid shore pollution.

Expected to be in operation within two years, the mill will manufacture high grade sulphate pulp to sell to paper mills. It also will be equipped to make purified pulp for explosives. It will employ 250 persons.

Glidden Expects to Produce Cortisone From Soybean

Glidden Co., Cleveland, Ohio, which has been carrying out promising work at its steroid laboratories, expects to produce large quantities of cortisone and related cortical hormones from soybeans. Meanwhile it has started to make commercial cortisone at its Soya Products Laboratory, Chicago, Ill., from animal bile acids.

Hormones and steroids found in the human adrenal cortex may be made from soya sterols. Glidden has aimed in its research to develop techniques for commercial production.

Until they are developed, Glidden will make cortisone from animal bile. The Chicago laboratory, which has been making small amounts for research and clinical purposes, has started commercial production; and will turn over its entire output to pharmaceutical manufacturers. The production, says P. E. Sprague, a vice president of Glidden, will probably not affect the price of cortisone.

(Continued)

Are you turning in all your SCRAP?

Don't wait for "George" to do it

IF you are a steel user, this important job of getting more scrap back to the mills is directly up to *you*. You just cannot afford to sit idly by while the scrap shortage gets worse. For unless everyone really pitches into this job of digging out all the scrap possible, steel production is bound to suffer, and every steel user, in more or less degree, will suffer too.

More scrap means *more* steel—it's as simple as that.

Right now some mills have only a bare two-days' supply of scrap on hand. Others have even less. Some steel-making furnaces already have had to shut down for lack of scrap. The situation is serious. Only you can help improve it.

By turning in every piece of worn-out equipment, every obsolete tool and machine, in fact every pound of iron and steel scrap you can comb out of your plant, you'll be helping relieve the worst scrap shortage since Pearl Harbor days . . . and the steel industry will be able to produce more of the steel you need.

Remember—it takes at least one-half ton of scrap to make one ton of steel. To maintain steel's present high production schedules requires more than 1400 carloads of industrial scrap *every* day. So turn in your scrap—ALL your scrap—and keep the mills rolling. This is more than a shortage. It's an emergency that vitally concerns you—and us—and the Nation.

You'll find your local scrap dealers listed in the yellow pages of the phone directory.

USS

1-1348

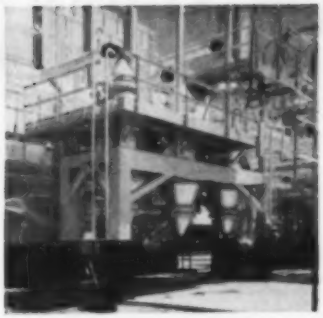
This page would ordinarily be used to tell you about

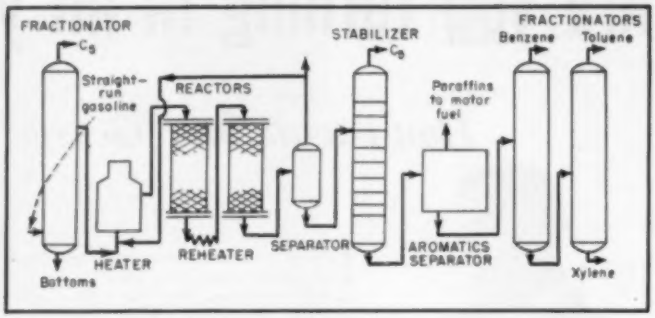
U·S·S STAINLESS STEEL

but, because without SCRAP we cannot produce steel, we are asking instead for your all-out help in getting more SCRAP to the mills.

AMERICAN STEEL & WIRE COMPANY, CLEVELAND
COLUMBIA STEEL COMPANY, SAN FRANCISCO · NATIONAL TUBE COMPANY, PITTSBURGH
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM · UNITED STATES STEEL COMPANY, PITTSBURGH
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

UNITED STATES STEEL





Platforming Sets Benzene Pace

Catalytic reforming of petroleum is in the spotlight as a source of aromatics; we're banking on it to pull us out of the benzene crisis. And Platforming sets the pace.

Exactly two years ago the world's first commercial Platformer went on stream at Muskegon, Mich.

It was put in by Old Dutch Refining Co. to upgrade the octane rating of its straight run gasoline by catalytic reforming (*Chem. Eng.*, Oct. 1950, p. 172).

Then came Korea and the national defense program. Demand for higher octane fuels skyrocketed; a tight benzene situation turned into a crisis.

The new Platforming process, developed by Universal Oil Products Co. of Chicago, was perfect for jumping into the breach on both counts; units began to go up from coast to coast. Now there are six Platformers on stream, twelve being built and close to a half-dozen in various stages of planning (see *table*).

More Benzene: Of these 21 Platforming units, six are being designed to recover aromatics—especially benzene—for chemical use. The remainder will be used for turning out high-octane gasolines (for which the new platinum-base catalytic reforming process first pulled so much attention two years ago).

A quick tally shows that these six aromatic-producing Platformers should be turning out benzene at a rate close to 50 million gallons yearly by the end of 1952, when most of them will be on stream. This will be the lion's share of the synthetic petroleum benzene being made by that time.

Giant of the Platformers designed specifically for synthesizing aromatics is Shell's unit now going up at Houston. It will add nearly 19 million gallons of benzene to the nation's annual supply of that basic chemical.

Shell's plant—to go on stream in mid-1952—will also turn out some 35 million gallons of toluene a year.

Standard of California's unit at El Segundo is almost as big: 13 million gallons of benzene a year. Foundations are now being put in and the plant should start operating by next summer. Cost will be in the neighborhood of $12 million. Its 3,200 bbl. a day of toluene will be blended into aviation fuels.

Atlas Processing is putting up a Platformer to recover close to 6 million gallons annually. It will use naphthas from the Carthage, Tex., extraction plants. Completion date: early 1952.

Cosden's plant at Big Spring will recover over 1.5 million gallons of benzene a year. This plant is designed chiefly for aromatics, but it will make some Platformate for motor fuels. Its annual output includes about 5 million gallons of toluene and 6 million gallons of xylenes.

Other units now being built or planned will have a yearly capacity of close to 15 million gallons of benzene. Thus it looks as if the annual Platformer benzene capacity may tot up to some 55 million gallons or more by mid-1953.

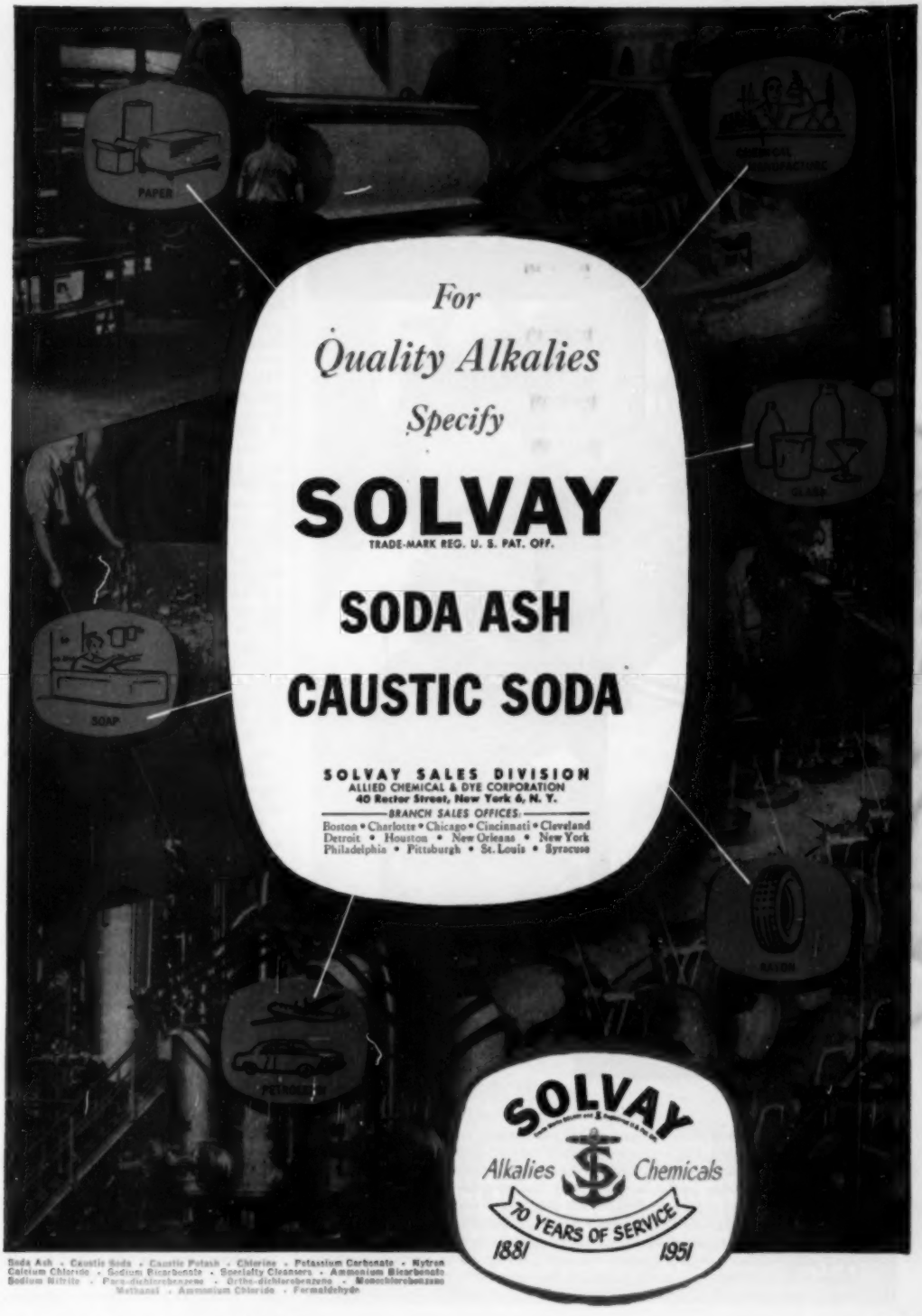
One feature of UOP's process makes it tough to estimate benzene capacity accurately: most Platformers

(Continued)

The platinum catalyst reforming picture as of today . . .

Who	What	Where
Aromatic Refining Co., Inc.*	Planned for	Baton Rouge, La.
Atlas Processing Co.*	Building at	Shreveport, La.
Aurora Gasoline Co.	Building at	Detroit, Mich.
Bell Oil & Gas Co.	Operating at	Grandfield, Okla.
Bitumen & Oil Refineries, Ltd.	Building at	Australia
Canadian Oil Refineries, Ltd.	Building at	Froomfield, Ont.
Continental Oil Co.*	Planned for	Lake Charles, La.
Cosden Petroleum Corp.*	Building at	Big Spring, Tex.
Eastern States Petroleum Co.	Building at	Houston, Tex.
Johnson Oil Refining Co.	Operating at	Cleveland, Okla.
Kendall Refining Co.	Operating at	Bradford, Pa.
Mid-West Refineries, Inc.	Operating at	Alma, Mich.
Old Dutch Refining Co.	Operating at	Muskegon, Mich.
Petroleum Specialties, Inc.	Building at	Detroit, Mich.
Premier Oil Refining Co.	Operating at	Ft. Worth, Tex.
Roosevelt Oil & Refining Co.*	Building at	Mt. Pleasant, Mich.
Shell Oil Co.*	Building at	Houston, Tex.
Skelly Oil Co.	Building at	Longview, Tex.
Standard Oil of California*	Building at	El Segundo, Calif.
Sun Oil Co.	Planned for	Toledo, Ohio
Taylor Refining Co.	Building at	Port Isabel, Tex.

* Designed to recover benzene.


PAPER
SOAP
PETROLEUM
GLASS
RAYON
For
Quality Alkalies
Specify
SOLVAY
TRADE-MARK REG. U. S. PAT. OFF.
SODA ASH
CAUSTIC SODA
SOLVAY SALES DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.
BRANCH SALES OFFICES
Boston • Charlotte • Chicago • Cincinnati • Cleveland
Detroit • Houston • New Orleans • New York
Philadelphia • Pittsburgh • St. Louis • Syracuse
SOLVAY
Alkalies Chemicals
70 YEARS OF SERVICE
1881 1951
Soda Ash • Caustic Soda • Caustic Potash • Chlorine • Potassium Carbonate • Nytron
Calcium Chloride • Sodium Bicarbonate • Specialty Cleansers • Ammonium Bicarbonate
Sodium Nitrite • Para-dichlorobenzene • Ortho-dichlorobenzene • Monochlorobenzene
Methanol • Ammonium Chloride • Formaldehyde

VACUUM VOLUME PROTECTION for your PRODUCTION

READ STANDARD
CORPORATION

Readco Spiral Ribbon Vacuum Mixers enable you to avoid undesirable oxidation ... to recover solvents and evaporate moisture from large batches without the excessive, detrimental temperatures necessary under atmospheric conditions.

The single packing gland construction of Readco Vacuum Spiral Ribbon Mixers necessitates sealing against vacuum only where the drive shaft enters the vacuum chamber. Lubricant cannot possibly enter the mixing chamber.

No pressure differential exists across the quickly removable split seals.

A quickly opened, flush-plug discharge gate prevents accumulation of dead volume. Single or divided jackets provide a wide range of temperature control.

Bakery-Chemical Division, YORK, PENNSYLVANIA, LOS ANGELES, CALIFORNIA.

can switch with comparative ease to either aromatics or motor fuels. Some plants are actually being designed to produce both products intermittently.

This process flexibility is a factor—and a big one—in the economics of benzene production by Platforming.

Other Processes: Although Platforming has pretty well held the spotlight, there are other important ways to synthesize benzene from petroleum. Most of them—like Platforming—are based on catalytic reforming of naphthene fractions.

One of the most recent is Houdriforming, developed by Houdry Process Co. (*Chem. Eng.*, Aug. 1951, p. 74). Sun Oil is putting in a Houdriformer at its Marcus Hook, Pa., refinery. Capacity: 13 million gallons of benzene annually.

Atlantic Refining Co. plans to put up a $6 million plant at Philadelphia to recover benzene and toluene, using its own catalytic reforming method. Its annual capacity will be close to 7 million gallons of benzene.

Shell Oil has been synthesizing benzene at Wilmington, Calif., on a commercial scale since 1947. Present output is at the rate of 12 million gallons annually. The process, a modification of the method used to make toluene during World War II, hinges on catalytic isomerization of methyl pentanes to cyclohexane, then dehydrogenation to benzene.

Other firms that will produce benzene from petroleum include Pan-American Refining at Texas City and Standard Oil (Indiana) at Whiting. Both will use Hydroforming processes.

How Platforming Works: Benzene synthesis by Platforming hinges on the methylcyclopentane and cyclohexane fractions in highly naphthenic gasolines. Principal reaction is dehydrogenation in a one-stage operation.

Naphthenes usually amount to 20-55 percent in the straight-run gasolines used as feed stock. There is normally 1-9 percent of natural benzene in the 140-185 deg. feed fraction.

The Platforming feed is passed through reactors (see cut) filled with a supported platinum-base catalyst in the form of 1/8-in. pellets or spheres. There are several of these reactors, usually four, in series.

Here the methylcyclopentane and cyclohexane are dehydrogenated to benzene; part of the split-off hydrogen is recycled to the heater. Natural benzene in the charging stock passes through unchanged.

Temperature in the reactor is about 900 deg. F., pressure about 250 psi. Low pressures favor dehydro-

genation to aromatics; high pressures increase hydrocracking of the paraffins. The process is continuous as periodic regeneration of the catalyst is not necessary.

After passing through the reactors, the aromaticized stream is sent through a stabilizer column, then to a separator to remove paraffins for motor fuels. Finally, fractionators separate the benzene, toluene and xylenes.

In a charge stock of 36.6 weight percent of methylcyclopentane and 11.3 percent cyclohexane, the potential yield of benzene is 44.4 percent. If the stock has 3.6 percent natural benzene, then the total potential weight yield of benzene is 48 percent.

Actual yield will vary from 75-92 percent of the theoretical, depending on recycling and the severity of the operations.

Magnesium Plant Reopened After Six-Year Shutdown

Plant of Diamond Magnesium Co. at Painesville, Ohio, has been taken out of mothballs. The government-built $16 million plant, after six year's idleness, is again making metal. By the end of the year, it may be in full production.

The plant, which is a wholly-owned subsidiary of Diamond Alkali Co., Cleveland, produces magnesium at the rate of 18,000 tons annually. It employs about 600 persons when in full production.

Canadian Research Develops A Water-Repellent Aerogel

Process for the production of an improved type of dried silica aerogel has been developed by the National Research Council of Canada.

Aerogels have many practical uses: thermal insulation, flattening agents for lacquers and varnishes, filler for printing inks, and thickening agents for oil to produce lubricating grease.

Water, however, will destroy a silica aerogel. Silica has an affinity for water. Water forms an emulsion containing the silica, and destroys the gel.

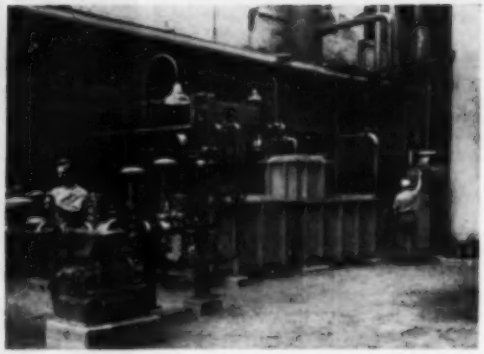
But the Council's Division of Chemistry has discovered a way to waterproof the gel surface. In the process of making the aerogel, an alkyd type resin is added to the silica slurry during autoclaving. The resin cures and coats the silica surface, making it water-repellent.

This coating enhances many of the desirable properties of the aerogels. And it produces no undesirable effects.

(*Continued*)

reduce
CORROSION
problems
with
FAHRITE
STAINLESS STEEL CASTINGS
In the chemical industry FAHRITE is withstanding the costly, gnawing action of corrosive fumes, liquids and gases. Several applications are shown here. The coil below, completely fabricated by Ohio Steel, consists of stainless steel tubes, Fahrite corrosion-resistant U-bends and Fahrite heat-resistant tube sheets. This was shipped as a complete unit.
Our engineers and metallurgists will team up with you on any job that is coming up.
THE OHIO STEEL FOUNDRY CO.
SPRINGFIELD, OHIO
PLANTS AT SPRINGFIELD AND LIMA, OHIO

Furnace, heart of Koppers-Hasche process, makes city gas from gasoline, propane, butane, light oil or natural gas.



Plant—with its pressure and metering equipment, furnace, and cooling tower—makes 1 million cu. ft. of gas per day.

Wanted: Reformed Natural Gas

New process—which reforms natural gas to a low Btu. content for home use, employs either a thermal or catalytic mechanism—is one answer to a current demand.

Put into operation last month at the East Plant of Rochester Gas & Electric Corp., Rochester, N. Y., the versatile Koppers-Hasche process can make a 300 Btu. gas to reform natural gas or a 1,050 Btu. gas to supplement natural gas, using as a raw material gasoline, propane, butane, light oil or natural gas. With only few changes, the process may synthetically produce benzene, ethylene, acetylene.

At Rochester distributors of newly available natural gas have to make a decision. Either they convert meters and fixtures in homes to use natural gas, and this would cost millions; or they reform the natural gas to suit the meters, and this could be expensive too.

Most decide it would be cheaper to reform the gas.

As a result they are shopping around for a method of reforming that will solve the many problems created by the home-use of natural gas.

Supply is the big problem. No one can draw unlimited supplies of gas from a cross country pipeline. Breaks in the line, or peak demands due to unusual weather, could foul up the flow of gas.

A reforming process, therefore, must make a high as well as a low Btu. gas: a high to supplement natural gas supplies, and a low to cut the natural gas to meter size (around 540 Btu.) during normal operating times. It must do this of course at a relatively low cost.

Koppers-Hasche process, Koppers Co., Inc., Pittsburgh, Pa., believes, solves these problems.

The new process, J. Hawley Taussig, Jr., manager of the gas department at Koppers, claims, is particularly appealing because of its low cost. Although the Rochester plant is only a demonstration unit that produces, he estimates, 1 million cubic feet of gas a day, a full scale plant, capable of making gas for an entire city, could be built at far less cost than any other process.

The reason: its simplicity.

Heart of the Koppers-Hasche process is a reforming furnace. Inside is a core of checker tile 9 in. wide and 20 in. high, divided in the center by a reaction chamber in which a catalyst may or may not be used, depending upon the type of gas to be produced. Surrounding this core is 4½ in. of high duty refractory brick, a like thickness of insulating brick and a steel shell 1 in. thick. The gas and air mixture flows for 1 min. in one end of the 20 ft. long furnace, then for 1 min. in the other end.

As the gas passes over the heated brick, the chemical change takes place, and outlet pipes lead the reformed gas to a cooling tower and then to storage holders. Pressure generated in the process eliminates the need for exhausters. Careful control of the process is had through a special control panel that records temperatures, rates of flow, pressures, and analyzes the gas mixture.

Once in operation, the unit needs only periodic checking by one operator. The process may be started cold; and it will be operating at near capacity in one hour. Changeover from one type of fuel to another can be made in only the time it takes to regulate valves and adjust heat conditions.

In the near future chemical industries may adopt the Koppers-Hasche process. They have already shown interest, Taussig says. Right now installations are being tested in four chemical plants.

The process can be converted for chemical work. With only minor changes in raw materials or production procedure, the process can synthetically make benzene, ethylene and acetylene.

Koppers Corp. is making its bid now for a place in the future of natural gas reforming. It may have its hat in more than one ring.

Vinyl Chloride Plant Planned In Kentucky By Goodrich

B. F. Goodrich Chemical Co. will build a new plant in Calvert City, Ky., 27 miles southeast of Paducah. First material to be produced will be vinyl chloride monomer. It will be shipped in bulk to the Goodrich plant in Avon Lake, Ohio.

The plant, on a tract of 175 acres, will cost more than $5 million.

Goodrich decided to build in Calvert City because essential raw materials and power were available. The Tennessee River gives accessible water transportation.

Three buildings to house manufacturing operations, service and maintenance facilities, power plant and office will be started as soon as DPA approves construction. *(Continued)*

WILLIAMS
Heavy Duty HAMMERMILLS for INDUSTRIAL USE

Reduce ANIMAL • MINERAL • VEGETABLE MATTER

CHEMICALS, SOAP CHIPS, ETC.
Many dry chemicals are being ground with Williams Heavy Duty Hammermills. Capacity is unusually high and power involved and maintenance extremely low.

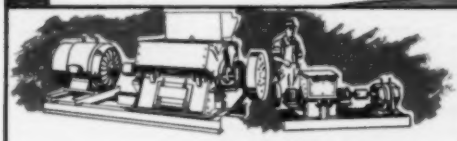
OIL CAKE (INCLUDING SOYA), COPRA AND COTTONSEED
Such material, easily ground for use as animal food, whether it is expeller cake or hydraulic press cake.

ANIMAL AND FISH BY-PRODUCTS
Hundreds of installations are daily proving our claims for better and more satisfactory reduction of such materials as — cracklings, tankage, fish scrap, raw and dry bones, etc.

GARBAGE, SEWAGE
Many canneries, breweries, and municipalities reduce waste materials for disposal with Williams Heavy Duty Hammermills prior to flushing through the sewers with water.

STEEL, ALUMINUM AND OTHER METAL TURNINGS
Such materials are readily reduced to "hand shovel" size for easier handling. A metal trap catches studs, bolts and other uncrushables.

ROOTS, HERBS, BARK AND CHIPS
Such vegetable substances are successfully shredded prior to commitment to extracting processes. This treatment permits maximum extraction from the material.



STANDARD DESIGNS FOR BIG OR LITTLE JOBS
Standard machines are available for the reduction of practically every material. Capacities range from 50 to 600,000 lbs. per hour.

WILLIAMS ALSO MAKES . . .
Impact and roller mills for 200 to 325 mesh grinding; drier mills; air separators; vibrating screens; steel bins; complete "packaged" crushing and grinding plants.

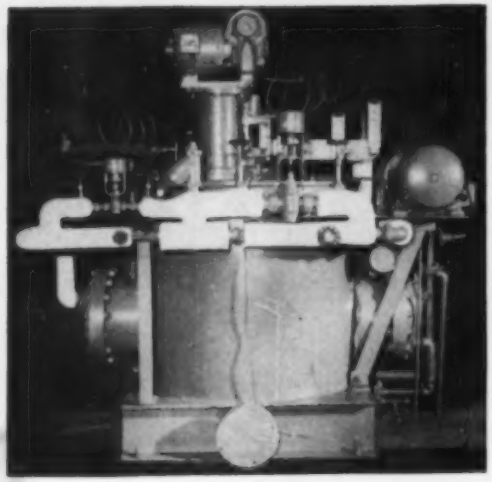
USE OUR FREE TESTING LABORATORY
Submit your grinding problems to Williams. A sample of the material and description of the desired result will set our facilities to work on a solution to your problem. Visits during test runs and technical consultations are invited.

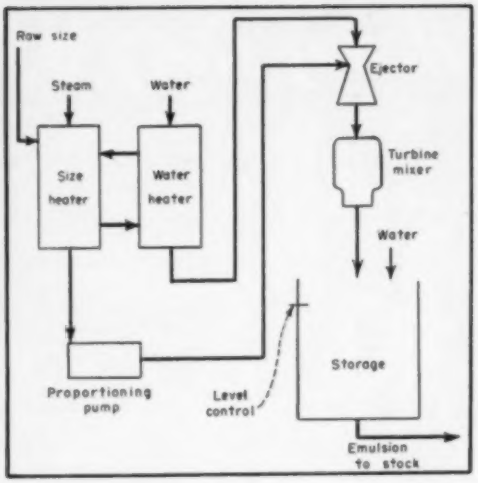
WC-80-1

WILLIAMS PATENT CRUSHER & PULVERIZER CO.
2706 N. Ninth Street **St. Louis 6, Mo.**

WILLIAMS
CRUSHERS GRINDERS SHREDDERS

OLDEST AND LARGEST MANUFACTURER OF HAMMERMILLS IN THE WORLD





Compact Emulsifier Helps Paper Makers

Automatic emulsification of rosin size offers maximum uniformity of concentration and quality, minimum preparation time. New packaged unit does the job.

Since Hercules Powder Co., Wilmington, Del., introduced its new improved automatic rosin size emulsifier in the spring of this year 30 of the new packaged units have been sold. And Hercules has a backlog of orders. The new unit is a big improvement on the original one, about 22 of which were installed in the little less than three years since Hercules first developed its emulsifying process for rosin size. The present packaged unit minimizes the human element in size preparation, giving obviously better quality control and lower operating costs. Hence the demand for these new units by the paper industry.

The emulsifier, engineered by Hercules, is a complete, compact unit, 6 x 6 ft. in size. The standard model handles up to 30,000 lb. of tank car size (80 percent rosin solids) per 24 hr., converting it to consistently uniform emulsions for use at up to 5 percent concentration. If necessary, capacity can be increased to 45,000 lb. per day.

For use in paper sizing, rosin must be finely dispersed and uniformly distributed throughout paper stock prior to sheet formation. Solubilizing rosin as the sodium soap and adding a dilute solution of the soap size to the stock was the historical method. An excess of alkali was required for solubilization. Later, processes for dispersing free rosin by partial neutralization were developed and sizes containing up to 40 percent free rosin could be used satisfactorily.

Most recent step is the development of an 80 percent solids prepared size for tank car shipments—emulsifiable into usable concentrations. When minimum preparation time or maximum uniformity are required, this packaged unit is the answer.

Paste rosin from storage flows to the size heating tank where it is brought up to the desired temperature. Control is by an automatic temperature-regulated valve. From the tank a pump (integrated with the tank) sends it to the ejector mixing unit. Venturi sections in this unit mix the size with hot water to form a primary emulsion. Water is heated in a heat exchanger on the side of the size heating tank. The primary emulsion goes to the turbine mixer—a cylinder with a spiral, rotating baffle. From there it flows to the emulsion storage tank and is diluted to working concentration with cold water to provide a 4-6 hr. supply for the mill. The three proportioning pumps, delivering size and hot and cold water in ratios for desired emulsion concentration, are driven by a single motor.

Float controls in the final emulsion storage tank operate at pre-set levels to start and stop operation of the emulsifier. Where size is added to stock at only one point, the emulsifier can be set to deliver directly to that point and will meter the flow as well.

Labor costs are reduced when the automatic emulsifier substitutes for man hours. The only labor necessary is the usual preventive maintenance work required by comparable mechanical equipment.

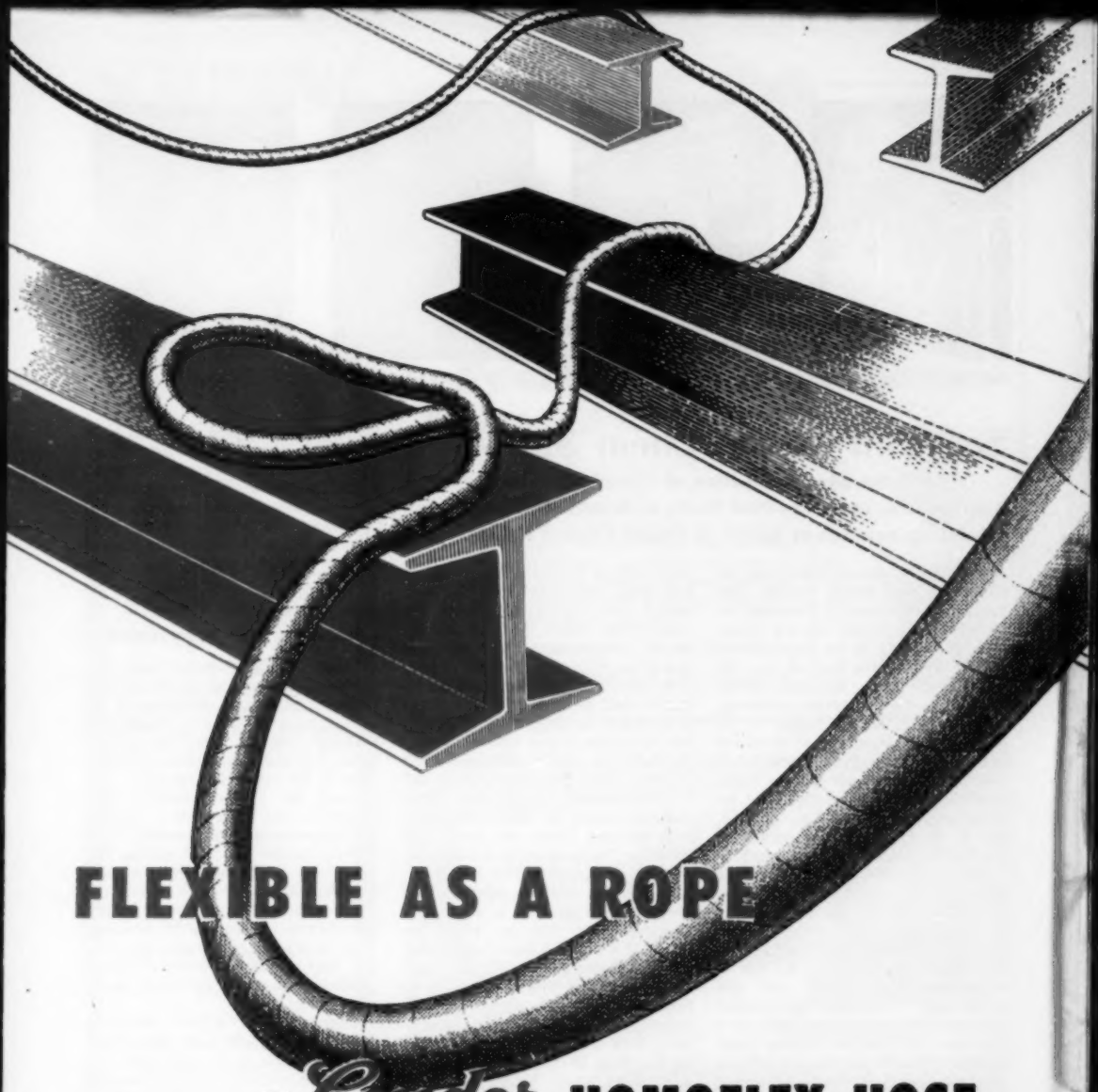
Emulsions prepared automatically are uniform in concentration and quality. In addition, this method of preparation is equivalent to a continuous supply of fresh emulsion in place of variably or excessively aged batch types.

Special sizes can be made because the freshness factor gives an independence from stability characteristics. Meta-stable emulsions can be used readily. Limited stability emulsions (up to 20-30 percent wax), which require special stabilizing chemicals for stability greater than a few hours, can be used without these chemicals when prepared automatically.

Original cost is less. Low-pressure steam is used for heating, which gives the unit an added advantage where high-pressure steam is in short supply.

The new automatic emulsifier was designed by Hercules to meet the need for an economical and simplified operating unit. It is the latest in a series of Hercules developments in the utilization of prepared rosin size. The packaged unit will be a boon to paper makers.

(*Continued*)



FLEXIBLE AS A ROPE

Condor HOMOFLEX HOSE

"Why, this hose is flexible as a rope!" say the men who work with it. • But it's no surprise to us—we engineered it that way. Homoflex has no pre-set twist, it coils and uncoils easily. It doesn't kink or collapse on sharp bends. It's light, but amply strong. It's easy to handle. It's sized uniformly. Workmen like it . . . It lasts longer. • How these advantages are built into Homoflex is in Bulletin 6879 D, mailed on request. • The same engineering goes into our V-belts, flat belting and conveyor belts. Just phone your R/M Distributor.

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose • Fan Belts • Brake Linings • Brakes Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive and Diamond Wheels • Bowling Balls

INTEREST in equipment, keen among chemical engineers, always reaches a peak when the chemical show comes to New York.

See You at the Chem Show

It's the 23rd Exposition of Chemical Industries, and it opens next month in New York, with over 400 companies exhibiting equipment galore at Grand Central Palace.

Chemical engineers converging on New York next month for the 23rd Exposition of Chemical Industries, to be held at the Grand Central Palace from November 26 to December 1, will be agog at the host of new developments to be unveiled. With more than 400 companies exhibiting, the show will be the biggest in 20 years. All four floors will be chock-full of new process equipment, machinery, instruments, materials and chemical products. Charles F. Roth of the International Exposition Co., manager, and E. K. Stevens, his associate, are bracing themselves for the onrush.

Just to pick out a handful from the thousands of new things to be exhibited, you'll see: the revolutionary Ferrolum process that produces homogeneous lead bonding to steel; a brand new multi-stage extractor for use in manufacturing antibiotics and also acetic acid; a two-stage high-pressure homogenizer; a dual cone fractionator that uses air alone to separate finely ground materials according to particle size; ultrasonic instruments for testing tanks, pressure vessels and process piping; a new hypersonic generator; Homoloid and comminuting machines for pulverizing wet or dry products requiring handling under completely aseptic conditions.

Also: A high-pressure hydraulic filter press that automatically fills, filters, presses and discharges cakes, doing jobs not possible before; a centrifuge using the return flow principle; evaporative heat exchangers; a new portable spray dryer; a high-speed atomizer for industrial spray dryers; an angle disintegrator; a novel Thermascrew heat exchanger; a top-stirred 2,000-psi. 5-gal. autoclave of seamless stainless steel with a hydraulic cover lift; a high-speed centrifugal mixer of new design; new predictable floats for variable area meters; a new mobile infrared spectrometer; an improved sealed-disk filter for clarifying liquid.

In addition, you'll see: the Sharples caustic soda process, using the Super D Hydrator to produce salt extremely low in caustic; a new silicone coating for tank linings; a radio-controlled electric truck; Neoprene-coated and lead-constructed pressure leaf filters and sheet filters for filtering sulphuric acid spinning baths and acetic acid solutions; an improved self-cleaning rotating leaf pressure filter that works not only on aqueous solutions but even on such products as pine gum; a micro pump that can deliver between 0.001 and 1.0 cc. per stroke, with a tolerance of 0.0001 cc.; compressor cylinders with carbon rings to furnish oil-free fresh air; pumps with capacities of 0.5 to 80 gpm. in pressures from 100 to 6,000 psi.; centrifugal castings of stainless steel in sizes and alloys never before produced; zirconium and titanium metals and their alloys and compounds.

On display will be the interior of a filter bag during an actual filtration cycle—filter, reverse air, shake—demonstrating this operation to the naked eye for what is believed to be the first time. Also exhibited will be a new Mikro-Collector for eliminating dust in handling plastic materials discharged from a dryer: one such machine, recently installed in an important chemical plant, operating at the rate of 30,000 cfm., handles enough dust-laden air in an hour to fill a pipe 1 ft. in diameter and 435 mi. long.

The chemical process industries will spend an estimated $5.5 billion for new plants and equipment this year and $27 billion more for raw materials. Many of these materials and this new equipment will be seen for the first time when the chemical show comes to New York next month.

New Technique Prevents Emulsions and Suspensions

Emulsions and suspensions are headaches for most gas manufacturers. Recently an Oregon producer of illuminating gas called on a California chemical company, which has a reputation for solving emulsion problems, to work on one of his pet pains. As a result the Oregon producer discovered a way to prevent emulsions and suspensions from forming. The remedy: sulphonates that reduce the surface tension of the water, and prevent formation.

Tar-water emulsions formed in gas manufacture are hard to break down. They increase requirements for storage. And lampblack-water suspensions are unwanted since they hold up processing time.

Engineers of Oronite Chemical Co., San Francisco, Calif., who practice prevention rather than cure, attacked the emulsion problem by adding the sulphonates to the primary scrubber. At the Portland Gas & Coke Co. they kept the surface tension in the tar scrubber water between 50-55 dynes. This did it. And the amount of the agent remained non-critical, varying from 0.05-0.1 percent.

Cost of emulsion prevention is negligible. About 7 lb. of sulphonates were added per generator per hour. Cost is small with a gas generator capacity of 66,300 cu. ft. per hr., and a price of $1 per hr. charge.

Thus far, on an experimental basis alone, 300,000 gal. of high Btu. tar

(Continued)

SCRUBBING CORROSIVE GASES?

Fig. 645

Are your scrubbing nozzles as efficient as you think they could be? Do they resist the corrosion or wear conditions satisfactorily — produce the breakup and distribution you would like?

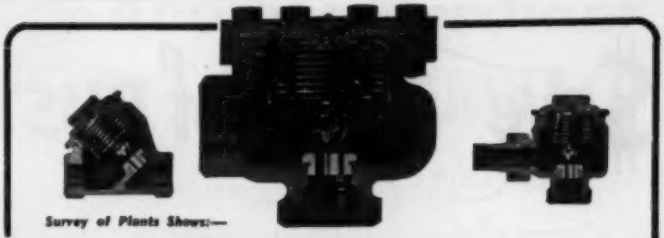
Outline your spray problem for us—if your liquid can be sprayed with direct pressure at all—Monarch can furnish the nozzles.

NOZZLES FOR:

- OIL ATOMIZING
- HUMIDIFYING
- AIR WASHING
- DESUPERHEATING
- SPRAY PONDS
- MILK POWDERING
- ACID CHAMBERS
- CONCRETE CURING

Write for Catalogs 6-A and 6-C

MONARCH MFG. WKS., INC.
2517 E. ONTARIO ST.
PHILADELPHIA 34, PA.



Survey of Plants Shows:—

15 of 20 Engineers Prefer Nicholson Traps

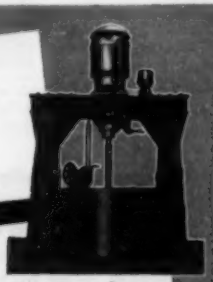
To determine the best steam trap on which to standardize, a large processing firm recently asked their plant engineers for their preference. In 15 out of 20 plants the choice was Nicholson.

The repeated adoption of Nicholson steam traps in plants currently in big "cost-reduction-through-modernization" programs is another indication of their advanced features. To learn why an increasing number of leading plants are standardizing on Nicholson thermostatic steam traps send for our catalog. 5 types for every power, heat, process use; size ¼" to 2"; press. to 225 lbs.

Catalog 751 or see Sweet's

W. H. NICHOLSON & CO. 206 OREGON STREET WILKES-BARRE, PA.

GET A *Fletcher*
the choice of many leading plants



for separation . . . filtering and dehydration of chemicals

Most all the construction and application facts are in our Booklet entitled "Fletcher Centrifugals for the Chemical Industry". Send for a copy today.

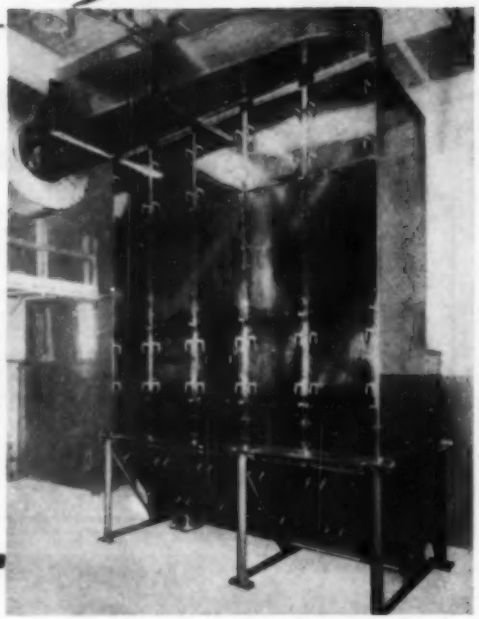
For a single or group arrangement to meet your processing problems . . . get a Fletcher. Our engineers will gladly assist your planning.

MOTOR DRIVEN SUSPENDED AND OPEN TOP

FLETCHER CENTRIFUGALS

FLETCHER WORKS, 125 GLENWOOD AVE., PHILADELPHIA 40, PA.

$ave $ out of DU$T



$AVE DOLLAR$ OUT OF DU$T
in Processing of
FERTILIZERS
PLASTICS
DRUGS & COSMETICS
FOOD MATERIALS & OTHER PRODUCTS

The Simon Suction Filter Dust Collector
U. S. Design and Manufacture by
ENTOLETER DIVISION

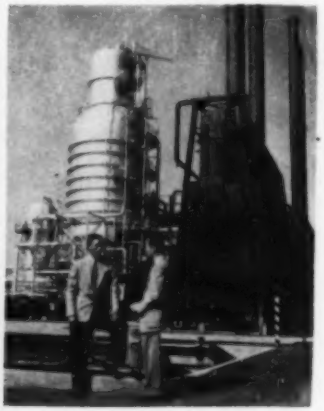
Dust problems are effectively solved with the Simon Suction Filter Dust Collector. This self-contained, all-metal unit needs no accessory equipment except a fan and connecting ducts. Dust is collected at practically 100% efficiency, permitting air to be blown out of the chemical plant without costly loss of materials, or into the building without risk of dusty atmosphere. Cleaned air from collector can be returned to plants to save heat in winter, and blown outside in summer to control humidity • Streamlined ALL METAL design with minimum ledges and dead spots • Minimum maintenance cost • Low power — 1-HP to operate 12-section unit • Operates under suction, eliminating dust leaks. Send for complete information. ENTOLETER DIVISION, The Safety Car Heating and Lighting Co., Inc., 1197 Dixwell Ave., New Haven 4, Connecticut.

Visit our Booth 460-461
at the Chemical Show

ENTOLETER
CENTRIFUGAL MACHINES

have been produced using sulphonated water. The sulphonates have added 0.25 c. per gal. to the cost of the dry tar.

Success at the Portland plants has caught the attention of Honolulu Gas Co., Seattle Gas Co., and British Columbia Electric Co. Ltd. (Vancouver). They are now experimenting with sulphonates in their own plants.



Stancal's Giant Stripper

World's biggest residuum stripper has just wound up its test runs at Standard of California's Richmond refinery. Test results will provide essential information on product quality and on the stripper's most efficient operating capacity (estimated to be about 50,000 bbl. per day). Working at top speed, Stancal engineers went from preliminary design of the stripper to final testing in less than 15 months.

Taking residuum from ordinary vacuum strippers, the residuum stripper makes a greater proportion of crude available to the catalytic cracker. The giant stripper converts more than 50 percent of its intake into charge stock for the cat. Thus Standard, now handling its full capacity of crude, expects to cut back current over-production of heavy fuel oils and to step up output of gasoline without increasing the amount of crude processed daily.

The new stripper won't be in full operation until December, however, since its integration calls for major alterations of other units at the Richmond refinery. Chief of these is conversion of the TCC (Thermofor Catalytic Cracking) unit to Houdriflow. Already under way, the entire conversion program is a multi-million dollar project.

Oil Worker Gets $1,500 For Idea, a Hopper Scoop

Howard Hannon, a refinery worker for General Petroleum Corp. at Torrance, Calif., suggested a way of taking catalyst samples that saved money for his boss, and made money for him.

Usually samples of catalyst are scooped from the bucket elevator. The elevator carries the catalyst from the regenerator to the cracker. It is necessary to stop the elevator to get at the catalyst.

The operation is difficult. Temperatures run around 900 deg. F. There is also a danger of spilling the catalyst. The cracking operation stops to permit cleaning; this is expensive.

Hannon's idea was to get the sample before the catalyst reached the elevator. A scoop could be lowered through an access door into the elevator hopper, and catch the sample catalyst falling from the regenerator into the hopper. The elevator problem would be solved. It worked.

General Petroleum, as a result of Hannon's ingenuity, will save thousands of dollars each year. There will be less wear on the elevator because it need not be started and stopped again under load; and of course there will be fewer hours of down time for cleaning out spilled catalyst.

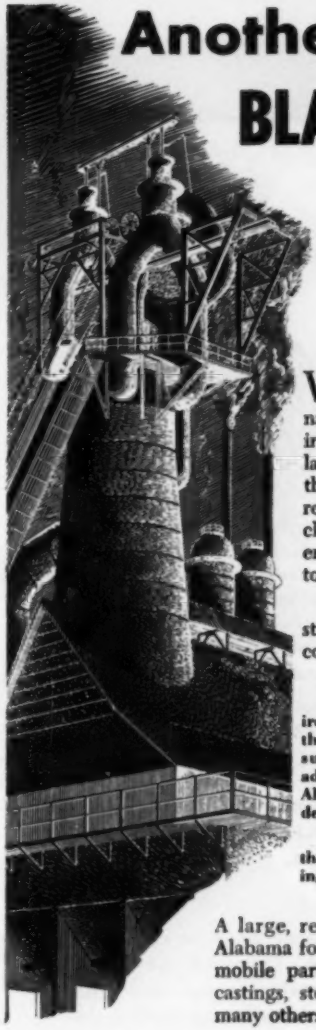
The company is happy, and so is Hannon. He received a $1,500 award; and posed for a picture with his new hopper scoop and his boss, Robert Minckler, president of General Petroleum.

New Techniques and Devices Subject of AIChE Symposium

New techniques and devices for process engineering will be the theme of the all-day symposium held by the New York section of the AIChE in the Grand Ballroom of the Hotel New Yorker, New York City, on October 25.

Porous metals—their manufacture, selection, fabrication and testing—

(Continued)



Another Merchant BLAST FURNACE

Will Soon Light Birmingham's Night Skies

Woodward Iron Company—one of the nation's biggest independent merchant iron producers—now has in progress the largest capital improvement program in the company's long history. Woodward's record-breaking expansion program includes construction of a new and modern blast furnace. Operation is expected to begin in the Fall of 1951.

Announcing the company's new construction program, President B. C. Colcord said:

"Prior to 1900, the bulk of merchant iron produced in Alabama was sold north of the Ohio River. Today over 95% is consumed by Southern foundries. We need additional capacity at our plant because of Alabama's rapidly accelerating industrial development.

"In the next year or two we are confident that many more plants using grey iron castings will come to Alabama."

A large, ready, nearby market now exists in Alabama for such finished iron products as automobile parts, bathtubs, boilers, pillow blocks, castings, stoves, electric equipment, gears and many others.

• • • • • •

The Committee of 100 or any of the undersigned members of the Executive Committee will welcome the opportunity to give you confidential and specific data regarding the advantages of the Birmingham district for your plant, office or warehouse.

BIRMINGHAM COMMITTEE OF 100

1916 Sixth Ave., N., Birmingham, Ala.

Executive Committee

Gordon Persons
Governor
State of Alabama

Bradford C. Colcord
President
Woodward Iron Co.

John S. Coleman
President
Birmingham Trust National Bank

Donald Comer
Chairman of the Board
Avondale Mills

William P. Engel
President
Engel Companies

W. W. French, Jr.
President
Empire Handley Hardware Co.

Clarence B. Hanson, Jr.
Publisher
The Birmingham News

W. H. Hoover
President
Employers Insurance Co. of Alabama

Mervyn H. Sterne
Sterne, Agee & Leach

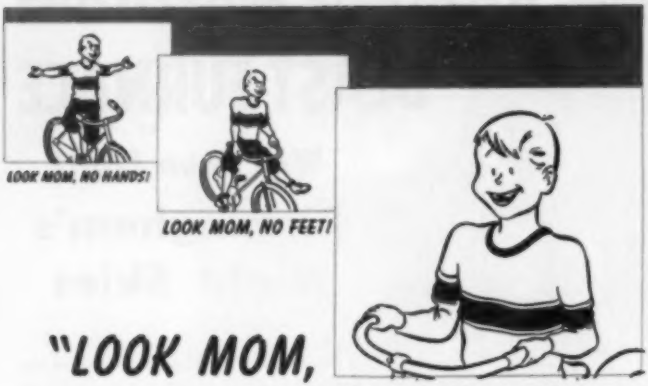
Claude S. Lowson
President
Sloss-Sheffield Steel & Iron Co.

Thomas W. Martin
Chairman of the Board
Alabama Power Co.

J. C. Persons
President
First National Bank

G. W. Schumbacher
President
Lowman, Joseph & Loeb

A. V. Wickel
President
Tennessee Coal, Iron & Railroad Co.



"LOOK MOM, NO TEETH!"

"... The gages specified on the above order are to replace standard clock gear movement type now in use to indicate pressures in several of our chemical processes which are subject to considerable pulsation. From previous experience the writer has found the Helicoid movement to be far superior to the old type."

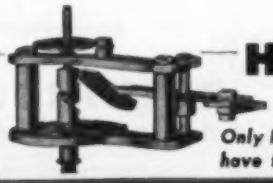
Signed by a Plant Superintendent.
Name of company on request.

There's only one reason why a plant superintendent would consider HELICOID gages "superior" to others on a tough application.

They save money!

Of course they have to be dependably accurate—long-lasting—easy to calibrate. Those are the advantages that add up to lower cost per gage, per year. And the more gages you use, the more substantial the saving.

Send for your copy of the new HELICOID GAGE catalog now.



HELICOID

Only Helicoid Pressure Gages have the Helicoid Movement

ACCO

HELICOID GAGE DIVISION
AMERICAN CHAIN & CABLE COMPANY, INC.
Bridgeport 2, Connecticut

TRADE MARK

discussed by David B. Pall, president of Micro Metallic Corp., will be the first of three talks at the morning session.

Hermetic pumps—their special use, principles of design—will be explained by D. Parker Litzenberg, president of Atlantic Pump Corp.

Electronic computing machines—their application in process control, distillation design, cost estimation, preparation of thermodynamic data and solution of heat transfer problems—by William P. Heising of International Business Machines Corp., will wind up the morning session.

Luncheon, to be served in the North Ballroom, will cost registrants $4, non-registrants $5.

Ion exchange resins—their applications in such fields as formaldehyde deacidification, sugar purification, ceramics, beverage treatment, food processing, textiles, and pharmaceuticals—by Robert Kunnin of Rohm & Haas will be given at 2:00 p. m.

Air cooled exchangers—their selection: a new approach to the solution of cooling problems—will be the subject of the talk by J. M. Whalen of the Trane Co.

In closing, flotation separation—techniques, chemicals and equipment—will be discussed by J. A. Barr of Armour & Co.

The symposium will hold registration from 8:00 a.m. to 3:00 p.m. The fee, J. F. Skelly and A. G. Parker, chairman and co-chairman, say, will be $1 for students, $2 for AIChE members, and $3 for non-members.

News Briefs

Vanillin: Monsanto will build a vanillin extraction plant in Seattle. A companion plant in St. Louis will process a semi-refined vanillin made from lignin. Cost of the two plants: $1 million.

Crude throughput will be boosted 10 percent by an expansion at the Lemont, Ill., plant of Globe Oil & Refining Co., Inc. Program includes alterations and additions to topping and cracking units, coke plant, and three new 120,000-bbl. storage tanks. Present output: about 40,000 bbl. per day.

Procter & Gamble will build a new plant near Sacramento, Calif., which will produce soap, soap powders and allied products. First units will be in operation in 1953. They will cost $2,685,980. The company, however, plans to invest a total of $25 million at the Sacramento location.

—End

"ZEPHYRWELD"® WELDING FITTINGS . . . SS Type 304-347-316—Inconel and other SS analyses. Fabricated in O.D. Pipe and Tube Size, ½ in. thru 24 in.—ells, tees, adapters, etc. Covered in Catalog 748.

RECESSED-END FITTINGS . . . Stainless Type 304-347-316. Low cost, light weight fittings for fast, simple soldering, brazing or socket welding. Sizes from ⅛ in. thru 24 in. Full line of elbows, tees, adapters, etc. Covered in Catalog 948.

Try

TRI-CLOVER

CLAMP-TYPE CONICAL FITTINGS . . . requires only 1 simple ferrule, assures leak-tight joints thru sanitary Teflon gaskets. Fast, simple assembly and disassembly. Full line in sizes from 1 in. thru 4 in.

SANITARY TYPE FITTINGS . . . Stainless Steel and Tri-Alloy (Nickel Alloy), from 1 in. thru 4 in. O.D., full range of fitting types. Approved as meeting 3A Standards throughout, incorporating exclusive design features. Covered in Catalog 150-B.

CONICAL END FITTINGS . . . Stainless Type 316—Inconel and other SS analyses. Complete line, sizes from 1 in. thru 4 in. O.D. Features: Light weight—low cost—fast installation—leak tight—easily adapted to other fitting types. Covered in Catalog 848.

. . . for the COMPLETE LINE of*
LOW-COST CORROSION-RESISTANT PIPING
. . . in both Tube O.D. and Pipe O.D. types

Here you see five representative fitting types that go to make up the *complete* Tri-Clover line—all available from one source. Install these stainless steel or alloy products in your process lines and realize the advantages of increased production and lower maintenance cost. 32 years of specialized experience in solving corrosion piping problems can be yours by consulting our engineers.

Write for details, or see your nearest Jobber

***ALL FROM 1 SOURCE**

The COMPLETE Tri-Clover Line includes:

- Flared Tube Fittings (Resistoflex)
- Tube B.W. Buttweld Fittings (Zephyrweld)
- I.P.S. O.D. Sch. 5 and 10 Buttweld Fittings (Zephyrweld)
- I.P.S. O.D. Sch. 40 and 80 Buttweld Fittings
- Flanged Conical End Fittings (Tube B.W.)—1" Through 4"
- Industrial Recessed End Fittings (Tube O.D.) 1" Through 16"
- Screwed and Flanged Valves (Pyramid)
- Special Fabricating Facilities
- 3A Standard Sanitary Fittings and Valves (Stainless Steel and Tri-Alloy)
- All Sanitary Magnetic Full-Flow Traps
- Centrifugal Pumps—Sanitary and Industrial
- Stainless Steel Tubing and Pipe—All Sizes and Analyses

Inventories carried in distributors' stocks strategically located throughout the United States.

Tri-Clover
MACHINE CO.
Kenosha, Wisconsin

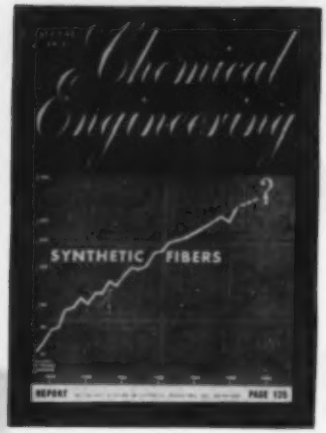
TRIALLOY AND STAINLESS STEEL SANITARY FITTINGS, VALVES, PUMPS, TUBING, SPECIALTIES

TRI-CLOVER

FABRICATED STAINLESS STEEL INDUSTRIAL FITTINGS AND INDUSTRIAL PUMPS

THE Complete LINE

Readers' Views & Comments



Sir:

We would like to obtain reprints of your 8-page report on synthetic fibers (August, pp.125-132).

It is the most complete and authoritative presentation of this subject that we have seen . . . and we would like very much to make the information available to our entire organization. . . .

M. H. Straight

Spencer Chemical Co.
Kansas City, Mo.

New Tonnage Oxygen Units

Sir:

Here are some further comments on your article "What Price Tonnage Oxygen?" in the July issue of *Chemical Engineering* that may interest your readers.

The six new Linde-Fraenkl units which will soon go up in South Africa for the South African Coal Oil & Gas Corp., Ltd., will have a capacity of 300 tons per day each. In addition to the three 190-ton units which are now being erected in Holland, three more 190-ton plants are under construction for installation in Ludwigshafen; these will be used primarily for coal gasification.

Since the Linde-Fraenkl process was introduced in 1930, a total of 78 Linde-Fraenkl plants has been installed throughout the world. Their combined capacity is 4,691 tons of oxygen daily.

It is apparent that oxygen is finding greater application in the chemical, steel and gas-producing industries throughout the world. At the same time, the capacity of the individual plant is steadily increasing. We feel that the use of oxygen in these industries is only starting. . . .

J. S. Bardin

Chemical Plants Div.,
Blaw-Knox Construction Co.
Pittsburgh, Pa.

▶ *We agree: the use of tonnage oxygen in the chemical and gas-producing industries is just beginning, especially in the United States.*—Ed.

Chlor-Alkali Power

Sir:

The process power requirements chart in your March issue gives another useful tool to chemical engineers in the electrochemical industries. . . .

I find your figure of 0.75 kwh. per lb. for salt electrolysis varies from our working figures. The operating details of the Hooker S cells are:

Current, amp.	7,500
Current efficiency, percent	96
Voltage	3.48
NaOH per cell per day, lb.	567
Cl_2 per cell per day, lb.	500

Under these conditions the power requirements for salt electrolysis (d.c. power only) should be 0.587 kwh. We operate Hooker S cells at 6,000 amp. and the energy consumption . . . is 0.59 kwh.

We also operate Billiter-Siemens cells. . . . The operating details are:

Current, amp.	6,000
Voltage	4.4
NaOH per cell per day, lb.	417
Cl_2 per cell per day, lb.	257

On this basis, the d. c. power consumption is 0.82 kwh. per lb.

Kindly indicate which type of cell you have taken as standard.

N. Kalyanam

Mettur Chemical & Industrial Corp., Ltd.
Mettur Dam R.S., India

▶ *Our figure of 0.75 kwh. is merely an average of various types of cells at various loadings. On the basis of these reported efficiencies, it is right in the middle of the range between Hooker S and Billiter-Siemens cells.*—Ed.

22 to 1

Sir:

Like so many others in our fast-moving chemical industry, I have a problem of keeping current with new developments. After regular routine reading of at least one weekly news magazine each day of the business week (*CW, C&EN, Time, OPD* and *Drug Topics*) my time available for other reading, when not bothered by jangling telephones and "business conferences," is extremely limited.

This morning, when that three-pound package of paper known as "CE" reached my desk, my first impulse was to set it aside with the wrapper still on it. However, I did tear it open—and was well rewarded for doing so.

I have read, for example, scads of articles, notes and blurbs about synthetic fibers. Yet I found your August over-all summary report so concise and informative I consider it time well spent. Also, the article on the current status of atomic energy was highly rewarding. . . .

Keep up the good work!

Name Withheld

Pacific Coast Manager
San Francisco, Calif.

▶ *We're glad to learn that our August issue (2 lb. 1 oz.) had plenty to offer this California subscriber even after he had read the 22 August issues of five weekly publications!*—Ed.

Sulfamate Danger

Sir:

A recent explosion at Du Pont's Linden, N. J., plant demonstrates that . . . a concentrated aqueous solution of ammonium sulfamate, when heated to certain temperatures, can undergo spontaneous hydrolysis; this can liberate enough heat, under adiabatic conditions, to cause the solution to boil. In a closed container, or one with only a small opening, enough steam pressure may be generated to cause a typical "steam boiler" explosion.

The explosion at Linden resulted from spontaneous hydrolysis of a concentrated and acidified ammonium sulfamate solution which was steam heated in a large storage tank having only a small vent. . . .

Experiments have indicated that a 60 percent aqueous solution of ammonium sulfamate at a pH of 5 must be heated to about 200 deg. C. to initiate the runaway reaction; at a pH of 2 only 130 deg. C. is required.

Solutions of ammonium sulfamate weed killer and flame retardant formulations will not have pH values below about 4.5 at concentrations of 60 percent or greater unless acid is added. If solutions are stored in open containers

(Continued)

Commemorating our 60th Anniversary

THE POWERS REGULATOR COMPANY

New Factory and General Office Building: **3400 Oakton Street, Skokie, Illinois**

World's Most Modern Factory Producing Automatic Temperature and Humidity Control

. . . to meet the greatly increased demand for POWERS products and to give you better controls, better deliveries and better values . . . these advantages are possible with our large new plant and modern production facilities. With an enlarged engineering and production staff, plus 60 years experience in heating, ventilating, air conditioning and process control, we believe we can be of greater service than ever before to our many friends who have contributed to our success.

WILLIAM PENN POWERS
. . . with his invention of the first all pneumatic system of temperature control and gradual acting vapor disc thermostat made an invaluable contribution to the modern science of heating, air conditioning and industrial process control.

Offices in Over 50 Cities. See Your Phone Book.

Chicago 13, Ill., 3819 N. Ashland Ave. • New York 17, N.Y., 231 East 46th Street • Los Angeles 5, Cal., 1808 West 8th Street • Toronto, Ontario, 195 Spadina, Avenue • Mexico, D. F., Apartado 63 Bis. (a55)

UNION PROCESS EQUIPMENT

Mixing Vessels

MIXING Vessels, Thinning Tanks with or without jackets for heating or cooling. Can be equipped with weigh scales or condensers. A.S.M.E. Code for pressures and vacuum. *Write for bulletin 121.*

UNION

PROCESS EQUIPMENT

UNION IRON WORKS
Since 1890
650 CASCADE ST. ERIE, PA.

NEW
PERMANENT
NON-SLIP

FIRM-GRIP
Genuine
NEOPRENE LATEX
GLOVES

✔ Permanent NON-SLIP on all 5 Fingers and Palm
Highly efficient embossed surface is *integral part* of glove

✔ Impregnable to ACIDS, CAUSTICS, OILS

✔ Curved FINGERS for Comfort and Easy Use

No. 5740-S LONG GAUNTLET
Length 14", Gauge .030 to .040
Sizes 9, 10, 10½, 11, 12

No. 5720-S LIGHT DUTY
Length 10½", Gauge .017 to .020
Sizes 7, 7½, 8, 8½, 9, 9½, 10, 11

★ Write for sample and prices

SEIBERLING
LATEX PRODUCTS CO.
AKRON 7, OHIO

200-5th Ave., New York
Merchandise Mart, Chicago

the temperature will not rise above the boiling point—approximately 107 deg. C. for a 60 percent solution.

Under ordinary conditions of use involving more dilute solutions, there appears to be no danger of rapid hydrolysis.

Sulfamic acid, a companion product of ammonium sulfamate, is much less prone to produce an explosive reaction through hydrolysis. We have been unable to produce a runaway hydrolysis of sulfamic acid at atmospheric pressure.

JAMES K. HUNT
Technical Adviser
Public Relations Dept.
E. I. du Pont de Nemours & Co.
Wilmington, Del.

► *We are glad to pass along Dr. Hunt's advice on how to avoid ammonium sulfamate explosions. Although no one was injured in the Linden explosion, the property damage was considerable.*—ED.

Kroll vs. Iodide Zirconium

Sir:

Under the heading "Zirconium Clarified" you published a letter . . . Some figures and tables were included indicating the differences in Iodide and B.M. or Kroll zirconium . . .

It may be true that Iodide zirconium is the more ductile. We have found that Kroll zirconium is sufficiently ductile and workable to produce all the usual forms required by the various industries, i.e., sheet, rod, and wire . . . we can produce, as a commercial product, sheet down to 0.004 in. and have produced some down to 0.002 in. Tube production has only been done on an experimental scale but it is hoped, in a few months, to offer this on the market. Tube with a wall thickness of 0.002 in. has been produced by cold drawing.

As far as corrosion resistance is concerned, tests indicate that there is not much difference. In a few cases where there is a difference it has been found that carbon is the main cause. As the carbon is absorbed during melting of the sponge to ingot in carbon crucibles, it is possible to avoid this contamination by using the argon arc melting technique. This has been successfully operated on other processes and it is only a question of time before Kroll zirconium, uncontaminated with carbon, will be available on a commercial scale.

The letter states that the Kroll zirconium is used as the "head feed" for the Iodide process, suggesting that the Kroll metal is crude zirconium requiring purification. As Kroll metal is used as an intermediate in the produc-

(Continued)

Your welders will seem like
Siamese Twins
When they use Midwest Welding Fittings, your welders will turn out so much more work that they'll seem like Siamese Twins. The reason? . . . The exceptional accuracy and uniformity of Midwest Welding Fittings enable your welders to spend more time welding and less time in preparation.
MIDWEST WELDING FITTINGS IMPROVE PIPING DESIGNS AND REDUCE COSTS
MIDWEST
PIPING & SUPPLY CO., Inc.
STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

heart of the strainer

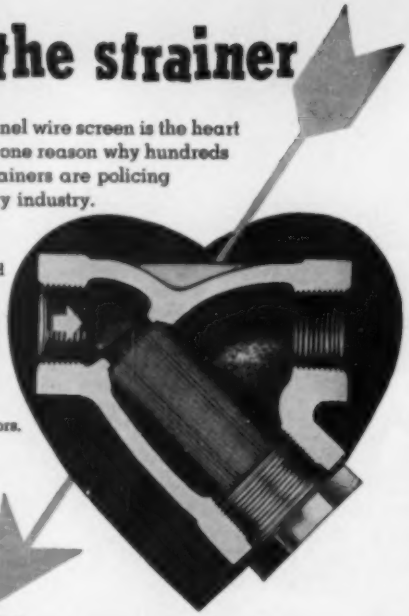
A high-grade, woven Monel wire screen is the heart of the Yarway Strainer—one reason why hundreds of thousands of these strainers are policing pipe lines in nearly every industry.

OTHER REASONS—

- cadmium plated bodies and screen caps
- straight threads, machined faces and spark-plug-type gaskets on screen caps
- ten sizes from ¼" to 3"

Sold by 216 industrial distributors. Write for Bulletin S-203.

YARNALL-WARING CO.
137 Mermaid Ave.
Philadelphia 18, Pa.

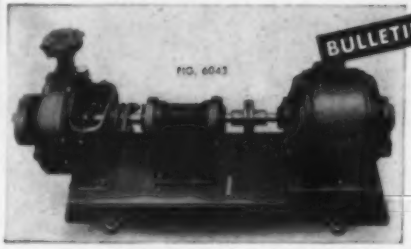


YARWAY STRAINERS

TABER for Higher PRACTICAL Performance

PUMP for EVAPORATOR SERVICE

BULLETIN CL-339 AVAILABLE



Especially applicable to Evaporator or Vacuum service, and any apparatus from which liquids are to be removed under vacuum. • Large chamber completely surrounds the stuffing box and seals perfectly against vacuum. • The water chamber surrounding the stuffing box can also be used as a drip chamber when pumping fluids from atmospheric pressure. • Sealed, double ball bearing shaft support is another feature of this Taber single suction centrifugal pump. • Built of any obtainable metal or alloy found suitable by customer. • Please use business stationery when writing for Bulletin CL-339.

TABER PUMP CO. *(Est. 1859)* 294 Elm St., Buffalo 3, N. Y.

TABER PUMPS

tion of Iodide zirconium, it would appear that the additional purity and ductility is achieved at additional cost, which may limit the use of Iodide zirconium.

It would have been interesting if the letter had quoted the dimension of the zirconium rod produced instead of referring to the diameter of the vessels in which the operations are carried out. It is true that the small rods of Iodide zirconium may be melted and cast into billets but in so doing most of the additional ductility is lost. The letter quotes figures for combined nitrogen and oxygen below 0.010 percent; it is interesting to compare this with the figures 0.058 percent oxygen and 0.013 percent nitrogen quoted by Litton in the *Iron Age*, April 5, 1951, as typical figures for arc melted Iodide zirconium.

. . . Iodide zirconium may be more ductile than Kroll metal but it is probable that the latter is sufficiently ductile for most purposes. The advantage gained by the Iodide process in producing more ductile metal is probably offset by the increased cost in refining. While it may be true that Kroll metal does not resist the oxidation of steam at 315 deg. C. as well as Iodide zirconium, nevertheless for most industrial purposes Kroll metal is quite satisfactory. The avoidance of carbon contamination during the melting of Kroll sponge may prove to be the main factor in determining its corrosion resistance.

Small rods of expensive pure ductile metal will, no doubt, have a definite application but it will be a very limited one.

G. L. MILLER
Research Manager
Murex Limited
Rainham, Essex
England

▶ *Our feature article on the Kroll zirconium process appeared in our March 1951 issue (p. 116). The letter on zirconium made by the iodide process appeared in our May issue (p. 234).*—ED.

Help from Abroad

Sir:

I have read with great interest your recent article about the crippling shortage of engineering manpower. . . .

There are a great number of scientists and engineers in Western Europe who are now out of work . . . but cannot enter the United States. Why not provide them work here in Europe under the guidance of American research directors?

Research is far cheaper in Europe . . . a scientist in France receives about

$100-250 monthly. These European scientists could work out preliminary research problems and the final work could be done in the better-equipped American laboratories. This would help out in the present shortage of scientific manpower and would create a reserve of able and gifted scientists . . . if the selection were judicious.

Such a stock of field-tested scientists in Europe could be very useful if, in case of emergency, preliminary mass work in research must be done.

H. BERLITZER
Chemist
Levallois (Seine)
France

Dacron Loses a Point

Sir:

I have read with a great deal of interest and respect your report in August on synthetic textile fibers. It is a most comprehensive and enlightening piece of work.

The report states that Dacron "is much stronger than wool, nylon, Orlon or silk." The statement would be correct were nylon omitted. The tenacity of Dacron ranges from 4.4 to 6.6 gpm., and the range for nylon is 4.5 to 7.7 gpm.

To the best of our knowledge, nylon is the strongest fiber in commercial production.

CHARLES H. RUTLEDGE
Public Relations Dept.
E. I. du Pont de Nemours & Co.
Wilmington, Del.

▶ *Du Pont's Dacron loses to Du Pont's nylon.*—ED.

Cards Click

Sir:

. . . I find your Reader Service useful, more helpful than any other form I know of. The staff card circumvents delay in addressing and mailing a special envelope . . . leaves the text totally unharmed.

All in all, your Reader Service set-up is the fastest, easiest way to get printed information that I have yet found.

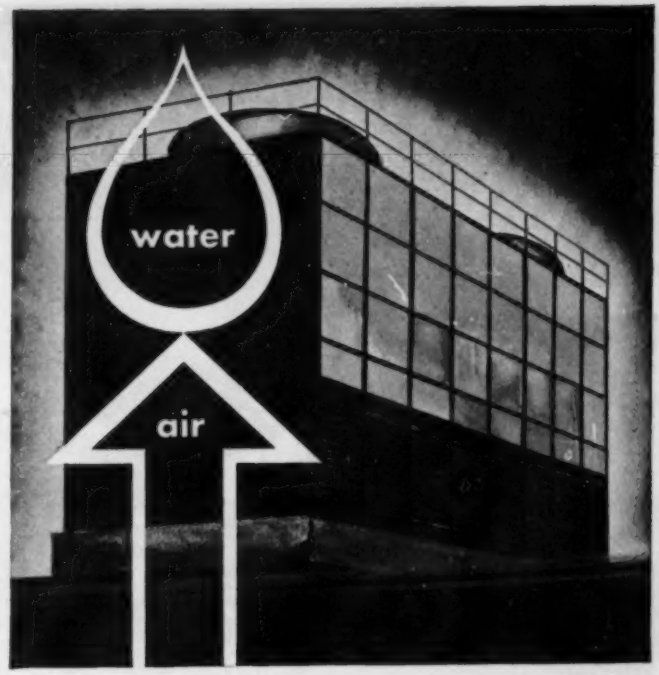
C. E. MCKNIGHT
Dept. of Chemical Engineering
Rensselaer Polytechnic Institute
Troy, N. Y.

From Cover to Cover

Sir:

Just . . . a note to tell you how much I like your new table of contents. . . . Little things like this may seem small but to me . . . they really are quite large. Congratulations.

FREDERICK BELLINGER
Chemical Engineer
Atlanta, Ga.



SEE OUR CATALOG IN SWEET'S

THE STORY OF AIR AND WATER, in intimate contraflow to produce the most efficient cooling is best told inside a WCEC cooling tower. For here, whether water is distributed through gravity splash system or Whirlcone spray nozzles, the tower design insures exposure of the maximum water surface per unit volume to the flow of cooling air, resulting in the optimum of cooling efficiency.

Mechanical draft towers — induced or forced, multiple unit, low head, or multi-stage — and natural draft towers, spray or deck type, are all engineered for speedy, efficient, economical cooling.

Whether your water cooling problem involves the chilling of 5 or of 50,000 gallons per minute, WCEC's complete engineering service prescribes the most economical, efficient tower for your needs. *Write today.*

Representatives in Twenty-eight Principal Cities

TOWERS OF STRENGTH
WCEC

WATER COOLING
EQUIPMENT COMPANY

MAIN OFFICE • New Hampshire Ave.
and Weber Road • St. Louis 23, Mo.

Fabricating Plants
ST. LOUIS, MO. • ARCATA, CALIFORNIA • HOUSTON, TEXAS

QUALITY *is important*

... NOW MORE THAN EVER

Partial view of plant at Neville Island, on the Ohio River, 8 miles west of Pittsburgh, Pa., showing main resin manufacturing and solvent refining units.

Neville service to industry is characterized by a traditional policy of continuous development and expansion, and co-operative technical assistance that means much to the buyer of chemicals.

You can be sure of quality on any Neville product you use—whether a resin, oil, solvent or specialty!

THE NEVILLE COMPANY **NEVILLE** PITTSBURGH 25, PA.

Plants at Neville Island, Pa., and Anaheim, Cal.

A-40

Don't let valve corrosion *slow down production*

Why take this chance, especially under present conditions? By coming to Powell for all your requirements, you are safe from every known form of corrosive action in your valves.

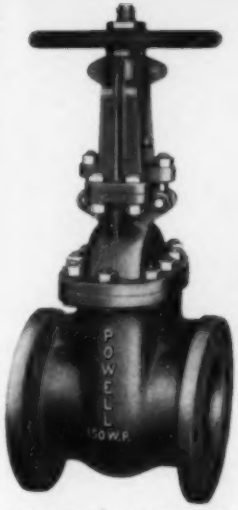


Fig. 1861—200-pound Stainless Steel Globe Valve with screwed ends, union bonnet and inside screw stem. In 2½" and 3" sizes these valves have bolted bonnets. Also made in various other corrosion-resisting metals and alloys.

Fig. 2491—Flanged End O. S. & Y. Gate Valve for 150 pounds W. P. Supplied with precision-fitted, quickly interchangeable solid or split wedges. Stem is threaded and guided through a revolving bushing screwed into the upper yoke, which has a compression lubricant fitting. Made in a wide variety of corrosion-resisting metals and alloys. Can also be furnished with screwed ends.

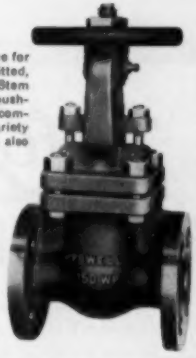


Fig. 2453-G—Large size 150-pound Stainless Steel Gate Valve. Made in sizes 5" to 30", inclusive. Has flanged ends, bolted flanged bonnet, outside screw rising stem and yoke. Separable yoke arms. Can be furnished with accurately guided, interchangeable solid or split wedges. These valves conform to all the latest standards. Available in a wide selection of other corrosion-resisting metals and alloys.

Fig. 1847—Small 200-pound Swing Check Valve with screwed-in cap and regrindable, renewable disc. Available in a wide variety of corrosion-resisting metals and alloys.

Bell-O-Seal "Y" Valve. Designed for high vacuum service and for handling hazardous, lethal, or malodorous fluids. Flexible metal bellows, enclosed in the body, completely seals interior of valve from outside atmosphere. Streamline design provides full flow area through valve. Made with flanged, screwed or welding ends in a variety of corrosion-resistant metals and alloys. Bell-O-Seal Globe and Angle Valves are also available.

POWELL VALVES for CORROSION-RESISTANCE are available in the following metals and alloys

Stainless Alloys
18-8S
18-8S Mo.
18-8S Cb.
Misco "C"
Durimet 20
11.5-13.5% Cr. Iron
18% Cr. Iron
28% Cr. Iron
25% Cr. 12% Ni.

Alloy Steels
Carbon Steel
4-6% Cr. .5% Mo.
3.5% Nickel Steel
6-8% Cr. .5-.75% Mo.
8-10% Cr. 1.1-1.5% Mo.

Nickel and Nickel Alloys
Nickel
Monel Metal*
Inconel*
Hastelloy Alloys† (A, B, C and D)
Illium
D-10

Cast Irons
Cast Iron
3% Nickel Iron
Ni-resist*

Hard Lead

Bronzes—Acid, Aluminum, Silicon
Everdur
Herculoy
Ampco
Ampcoloy
76
90-10
88-10-2

Aluminum
Alcoa No. 43
Alcoa No. B-214
Alcoa No. 61 S-T

Molybdenum

Silver

*Registered trade-names of the International Nickel Co., Inc.
†A registered trade-name of the Haynes-Stellite Co.

POWELL

The WM. POWELL CO., 2525 Spring Grove Ave., P. O. Box 106, Station B, Cincinnati 22, Ohio

DIFFERENT

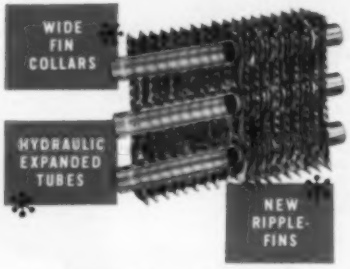
and what a difference!

McQuay's NEW RIPPLE-FIN COILS!

McQuay's new ripple-fin surface is the product of years of research aimed at producing the ultimate in heat transfer for any weight of metal. High efficiency is assured by forcing the air to follow an ever-changing direction of flow in passing through the coil. Thus the air repeatedly contacts the coil surface to give maximum contact time, maximum contact velocity, and a resultant optimum heat transfer.

With this advance in design McQuay retains the staggered tube and the McQuay rippled edge features, so well known in the industry and which contribute greatly to higher heat transfer, construction ruggedness, and eye appeal.

McQuay heating (blast) coils are available in a wide variety of styles and sizes. Hot water, cold water, brine, direct expansion, and refrigerant condensing coils are also available for practically every type of application. Write McQuay Inc., 1622 Broadway St., N.E., Minneapolis 13, Minn. Representatives in all principal cities.



EXCLUSIVELY YOURS IN McQuay COILS!

McQuay INC.

HEATING • AIR CONDITIONING • REFRIGERATION

Powdered catalyst is used in Synthol-process reactor. Commercial version of pilot plant unit above is under construction at new South African plant.

Oil From Coal Via the Newest Route

Chemical engineers have worked the latest twists into most processing steps at South African plant. Outstanding is synthesis step in Kellogg's radical Synthol unit.

Construction of the world's first modern, commercial oil-from-coal synthesis plant is now under way in South Africa. Engineered by M. W. Kellogg for South African Coal, Oil and Gas Corp., the $59-million project will start off by producing about 60 million gallons of gasoline and diesel fuel—equal to about 20 percent of South Africa's requirements. Capacity will later be stepped up to 100 million a year.

The new plant will utilize six 290-ton-a-day Linde-Frankl oxygen plants for the preparation of synthesis gas from coal. Installation of the units will be done by Gesellschaft für Linde's Eismaschinen A.G. who installed the first tonnage oxygen plants to use the regenerative principle.

A Lurgi pressure plant will gasify the coal (ash content, 26 to 29 percent) under the actual pressure needed for the subsequent synthesis—300 to 450 psi. The latest reports on the coal to be used have established that seven tons of coal will be needed to produce one ton of gasoline. For purifying: Ruhrchemie-Lurgi's Rectisol process. It substitutes single-stage for the old multi-stage method.

TWO METHODS

The synthesis step will be carried on by two different methods: (1) Kellogg's new Synthol process; (2) a German process jointly developed by the Ruhrchemie and Lurgi concerns. Both processes are improved versions of Fischer-Tropsch but differences between the two show up in the types of reactor vessels, catalysts and processing techniques. Radically new reactor vessel in the Synthol process handles powdered catalyst; Kellogg also had to develop a reformer that could adapt the synthesis gas to the new reactor. In the German process, Fischer-Tropsch's original fixed bed technique has been preserved. However, it is applied in a vastly improved form which increases daily output capacity from an average of 2 tons in the old type of plant to about 50 tons a day in modern installations. The Synthol plant, apart from its portion of fresh gas, will use the tail gas from the German plant in the synthesis operation.

Reason behind the decision to use two different syntheses is economic. The flexibility of operations allows shifts in the range of byproducts to suit market requirements. Whereas Kellogg's method yields essentially fuels, the Ruhrchemie-Lurgi process may be directed either to fuels production only, or to a larger output of paraffin wax and base stocks for chemical manufacture. According to SASOL's preliminary program, 50,000 tons a year of primary products will be derived from the Ruhrchemie plant and 150,000 tons a year from the Kellogg plant. Byproducts will be, on a yearly basis: 2 million gallons tar oils suitable for wood preservatives, for which there is a large demand; 800,000 gallons tar acids for plastic production; 8,000 tons of ammonia; and 1 million gallons of solvents for the paint, dry cleaning and other industries.

The initial gasification of the coal will result in more gas than can be treated by the synthesis plant. At first, therefore, it will be distributed for heating purposes to the highly industrialized area of Johannesburg by pipeline. The project is being built on 20,000 acres of ground 30 miles south of that city.

Reported This Month

FRANCE

Two expositions for the chemical industry will be held in Paris in November. They are (1) the 24th International Congress of the Chemical Industry, November 25 to December 1, sponsored by the Societe de Chimie Industrielle and (2) the 7th Exposition of Laboratory Supplies and Industrial Control Apparatus, November 22 to December 2, sponsored by *Chemie & Industrie*, French publication.

COLOMBIA

New refinery with a capacity of 35,000 bbl. per day will be built at Bogota for the Colombian government by the International Petroleum Co. It will include a modern

(Continued)

unit to produce aviation gasoline of more than 100 octane which will make Colombia independent from imports of this type of gasoline. Current output of motor gasoline will be increased by 100 percent per gallon raw oil. The plant will also be able to handle heavy raw oil of low gravity. Total cost of the plant is estimated at $22 to $25 million of which $10 million will be loaned by International Petroleum.

NETHERLANDS

First modern catalytic cracking unit in Europe has just been completed at Shell's Pernis refinery near Rotterdam. It will soon begin producing its full 1.25-million-ton capacity.

Stearic and oleric acids will be produced by the Emersol process at a new plant in Gouda. Blaw-Knox is handling construction for M. V. Vereenigde Stearine Kaarsenfabrieken.

AUSTRALIA

Alumina can be obtained from alunite by a chemical process evolved by three Australian scientists. Residues obtained after extracting potassium sulphate from calcined alunite are leached with hot hydrochloric. Increasing the concentration of hydrogen chloride to 30 percent precipitates hydrated aluminum chloride which is ignited to give alumina, hydrogen chloride and water. Process is made cyclic with respect to acid by fractionating the mother liquor to give dry hydrogen chloride and leaching acid. Iron and other impurities are purged from circulating acid by distilling a portion of the mother liquor.

Economic aspects of the process depend upon losses of hydrochloric, heat requirements and maintenance. Developers are N. S. Bayliss, W. E. Ewers and G. L. Miles.

INDIA

Ammonium sulphate production started last month at India's $50 million plant at Sindri in the state of Bihar. The country's first big state-owned enterprise was largely designed and built by Chemical Construction Corp., New York.

The plant has a production target of 350,000 tons a year which will be reached during 1953. Present demand for artificial fertilizers in India is about 400,000 tons. It is estimated that Sindri's maximum capacity will meet only 1/7 of the ultimate demand—between 2 and 3 million tons annually.

At present there are six other small plants in the country manufacturing ammonium sulphate. Their rated capacity is 80,000 tons, but production in 1949 was only 46,000.

The Sindri plant has been planned so that output can be doubled by installation of additional equipment. Alternatively, the plant can be expanded to produce other chemicals such as nitric acid, ammonium nitrate or nitro-chalk.

Cold urea formaldehyde curing lacquer, claimed to be superior to nitrocellulose wood varnish, has just been introduced by ICI (India) Ltd. At normal temperatures, this varnish reaches the tack-free stage in 2 hr., and overnight is harder than orthodox nitrocellulose wood varnish. It has good alcohol and hot water resistance, superior to high quality nitrocellulose wood varnishes and much superior to the usual shellac varnish used in India. As a consequence of its high solids content, excellent build and gloss are obtained and the finish is very pale in color.

CANADA

First major pipeline to carry natural gas from Alberta to the United States is now under construction. The 56-mile, $3.5-million line will carry the gas from the southeastern Alberta Kakowski Lake field to Anaconda Copper Mining Co.'s plants at Butte, Mont. It will handle a maximum 43.8 billion cu. ft. over a 5-year period. Under terms of the agreement with Alberta, towns along the pipeline will be allowed to draw gas for their own needs.

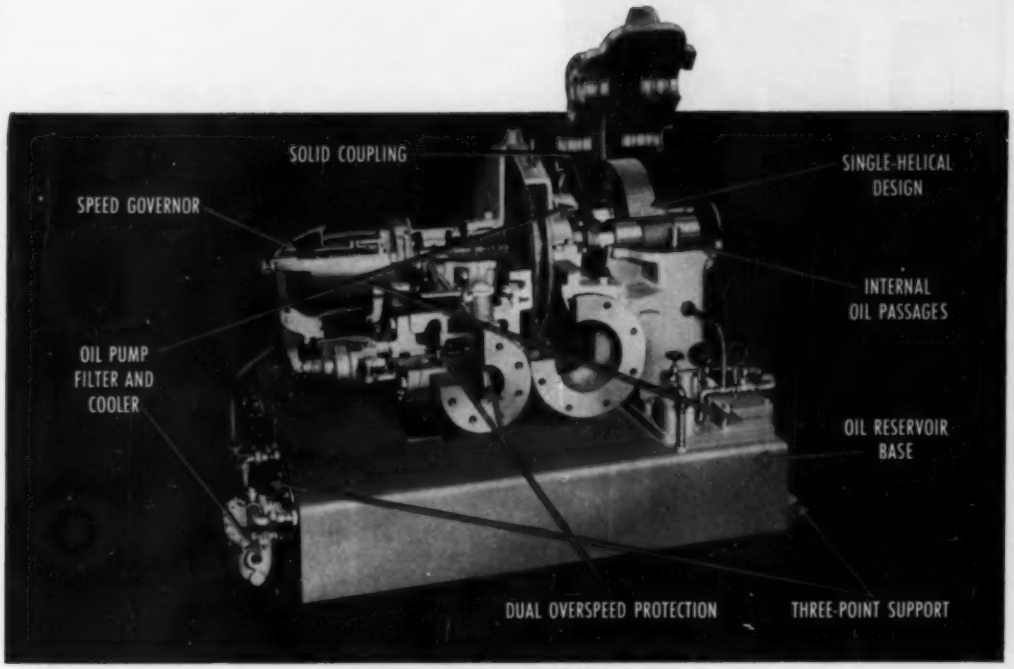
Basic nylon chemicals plant is being built by Canadian Industries Ltd. on the St. Lawrence River between Brockville and Prescott in Ontario. The plant is the largest single project yet undertaken by the company and one of the largest as well as most complex in the Canadian chemical industry to date.

When completed in the summer of 1953, it will make Canada self-sufficient in the two basic chemicals used in the manufacture of nylon yarn and staple fiber, instead of being dependent upon United States sources of supply. It will allow double the present Canadian production of nylon. Concurrently with the construction of this new

(Continued)

MOVABLE LATEX RESERVOIR FROM REBUILT SUBMARINE

Movable latex reservoir has been made out of an old submarine by Pirelli Co., Genoa, Italy, to relieve harbor congestion caused by unloading tankers into permanent reservoirs. Original nickel-chrome steel hull, 22 mm. thick, was a natural for resisting sea water infiltration. Company engineers cut the submarine's 85-m. length to 65 m., rearranged the five water tight compartments to meet needs of containers for latex, treated the inside of each with Inerthol paint as further purity insurance, installed pumps and a small analysis laboratory.



TYPE E Gearturbines

Cost Less to Buy . . . Less to Operate

Here's the ideal steam drive for ratings up to 500 hp and output speeds commonly found in single-ended applications such as pumps, fans, compressors, line shafts and generators. It's the Westinghouse Gearturbine that saves you money right from the start. You save on its purchase . . . you save on operating costs.

Save on purchase price because the Westinghouse Gearturbine comes as a complete package. It costs much less than buying a turbine and a separate speed reducer . . . costs less to install, too!

Save on operating costs because every turbine part has been built to give long life and dependable service. An anti-corrosion treatment on vital parts reduces wear and maintenance . . . and there's dual protection against overspeed.

You get these additional features:

Solid coupling of turbine shaft to pinion shaft, makes it easy to align pinion bearings with turbine bearing.

Single-helical gearing; endwise movement of one shaft will not affect axial location of the other. Running clearances are maintained.

Internal oil passages avert accidental damage, improve appearance.

Forced circulation of filtered oil assures thorough lubrication of gears and bearings.

3-point support for maximum ease in leveling and aligning.

Unique oil reservoir forms sturdy base for unit . . . simplifies mounting and installation.

Type E Gearturbines are available in any combination of three wheel sizes, three gears and three types of governor. Your nearby Westinghouse representative has all the facts. Ask him for Booklet B-4346, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-50524

YOU CAN BE SURE... IF IT'S
Westinghouse
TYPE E
Gearturbines

The four meters illustrated are part of a total installation of nine R-C Meters in a large processing plant. These units measure acetylene gas sold to nearby manufacturers, who also use R-C Meters at the receiving ends. Capacities range from 3,000 cfh to 130,000 cfh.

YOU CAN ALWAYS

trust

R-C METERS

If you're measuring gas for production processes, you can't take any chances on quantities. If you are buying or selling it, you need cash register accuracy. You want equal precision for departmental cost accounting.

The permanent accuracy of R-C Positive Displacement Meters has long been proved for all these purposes by manufacturers and utilities which buy, sell and use gas. Four important reasons account for this unvarying reliability:

1. Accuracy is not affected by variations in specific gravity, rate of flow, pulsation, moisture, impurities or uncontrollable factors.
2. Accuracy is not subject to adjustment of meter or recorder by operators or other persons.
3. Accuracy is not affected by reasonable overloads.
4. Accuracy is permanent because measuring chambers are surrounded by precision-machined, cast-iron surfaces.

The 31 standard sizes of R-C Meters give capacities from 4,000 cfh to 1,000,000 cfh. They are extremely compact, permitting installation in cramped spaces. Indicating and recording instruments are available for all types. For whatever purposes you measure gas, you can permanently depend on R-C Meters. Ask for Bulletin 40-B-14 or write us your specific problem.

ROOTS-CONNERSVILLE BLOWER CORPORATION
510 Illinois Avenue, Connersville, Indiana

ROOTS-CONNERSVILLE

BLOWER BUILDERS SINCE 1854

ONE OF THE DRESSER INDUSTRIES

plant, the nylon spinning plant at Kingston, Ont., will be expanded to twice its present capacity. It will absorb the entire output of the new chemicals plant. Heretofore, expansion at Kingston has been restricted by limited supplies of imported raw materials.

Huge soda ash plant may be built at Antigonish in Nova Scotia. A large salt deposit beside a bed of high-grade limestone, together with vast coal supplies nearby, may be used for such soda ash production purposes. The new plant would make about 200 tons daily and require an investment of $6 million. Sole soda ash producer in Canada now is Brunner Mond Canada Ltd., Amherstberg, N. S.

BRAZIL

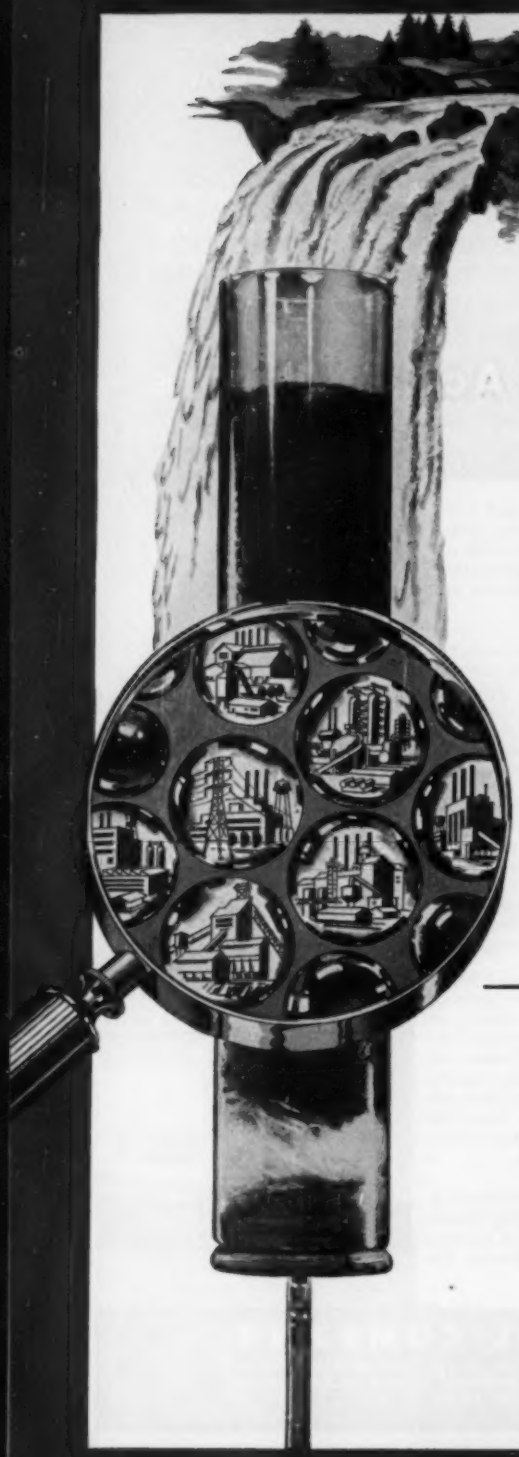
A 10,000-bbl. refinery is being designed and supplied by M.W. Kellogg for Cia. Refinaria de Petroleo do Distrito Federal. It will be located at Manguinhos on Guanabara Bay.

Foote Minerios Industrializados Ltda. recently lost an attempt to block by injunction a ruling by export import authorities which prohibits it from exporting significant amounts of monazitic concentrates to the U.S. About 1,500 m.t. are warehoused at the port of Victoria, of which most will be reserved for internal processing industries and and for strategic storage. Working the deposits near Victoria in addition to Foote Minerios is Monazita e Ilmenita do Brazil "Mibra" S.A.

MEXICO

Lost Iranian oil output may be partially replaced by Mexico. Pemex, government oil monopoly, had its biggest year last year and this year will be even better. Oil reserves rose from 1.27 billion barrels to 1.35 billion barrels during the past year due to new discoveries. Output jumped from 62 million barrels in 1949 to 74 million last year; Pemex hopes to jack it up to 90 million this year. Also among the company's assets are three handsome new refineries (one for aviation gasoline) and a $15 million lubricants plant now under way. And gasoline in Mexico is only 16 cents a gallon.

Oil authorities estimate Mexico's known reserves at 1.7 billion barrels, or about one quarter of Iran's known reserves. —*End*



CONTROL IONIZED SOLIDS AT ANY LEVEL WITHOUT EVAPORATION

Whether your process requires completely ion-free water, or merely a marked reduction in total ionized solids, AMBERLITE ion exchange resins will produce it. AMBERLITE resins give you, at low cost, an assured supply of the water you need from the water you have—despite variation in the *quantity* required and the *quality* of the raw water supply.*

Consider this:—Strongly basic AMBERLITE IRA-400 or IRA-410, plus strongly acidic AMBERLITE IR-120 can give you water with a total ionized solids content of less than 0.1 p.p.m. Weakly basic AMBERLITE IR-45 and strongly acidic AMBERLITE IR-120 eliminate metallic cations and mineral acidity, leaving only weakly acidic ions in solution. And weakly basic AMBERLITE IR-45 and weakly acidic AMBERLITE IRC-50 reduce total ionized solids substantially—at low cost. These are only a *few* of the *many* things you can do with AMBERLITE Ion Exchange Resins. For full details of these process improving resins, write Dept. CE1-9. There's no obligation.

MONOBED
Newest Word in Ion Exchange
One pass through one column of mixed anion and cation exchangers transforms raw water into high quality water. Ask for our 12-page booklet, Monobed Deionization.

*Of course, AMBERLITE resins remove only *ionized* solids but that's the big job! If your process requires sterile water, let AMBERLITE resins do the hard work, then feed completely deionized water into your still.

AMBERLITE is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries.

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

THE RESINOUS PRODUCTS DIVISION

Washington Square Philadelphia 5, Pa.

Representatives in principal foreign countries

ORONITE CHEMICAL COMPANY

THE NAME TO WATCH IN CHEMICALS

Why men who know specify Oronite

The maintenance of high quality standards in mass production of industrial chemicals has established Oronite as a prime source of supply to the chemical and processing industries. This combination of quality and quantity is reflected in a group of Oronite's .....

Surface Active Agents

which are being used in a variety of products and processes

A partial list of other Oronite Chemicals

NOTE!
Some of the following products including the wetting agents are currently in short supply.

Detergent Alkane
Detergent Slurry
Detergent D-50
Lubricating Oil Additives
Cresylic Acids
Gas Odorants
Polybutenes
Purified Sulfonate
Naphthenic Acids
Phthalic Anhydride
Ortho Xylene
Para Xylene
Xylol
Aliphatic Acid
Hydroformer Catalyst

The great variety of uses for the many Oronite Surface Active Agents covers everything from textile processing to ore flotation. Typical application of three such Oronite products are shown below.

WETTING AGENT "S" is an outstanding emulsifier for alkyd and vinyl resins and polymerized butenes. Its use improves water type surface coatings by increasing spreading and penetrating power. It is useful in the grinding of pigments and as a dispersing agent for pigments and dry colors.

ORONITE D-40, while primarily a detergent, also has high surface active properties which make it an ideal wetting agent in compounds marketed in dry powder or slurry form. Used in water soluble pastes and glues, D-40 increases spreading power and penetration, facilitates mixing.

SODIUM SULFONATES find valuable application as components in metal de-greasing compounds because of their ability to emulsify oils and greases. They are also valuable as detergent solubilizers, and as components in soluble oils, cutting oils and ore flotation reagents. They are produced in grades ranging from low molecular weight (water soluble) to high molecular weight (oil soluble).

If you are interested in improving your processing or developing better products through the use of Surface Active Agents, write to Oronite for more detailed information.

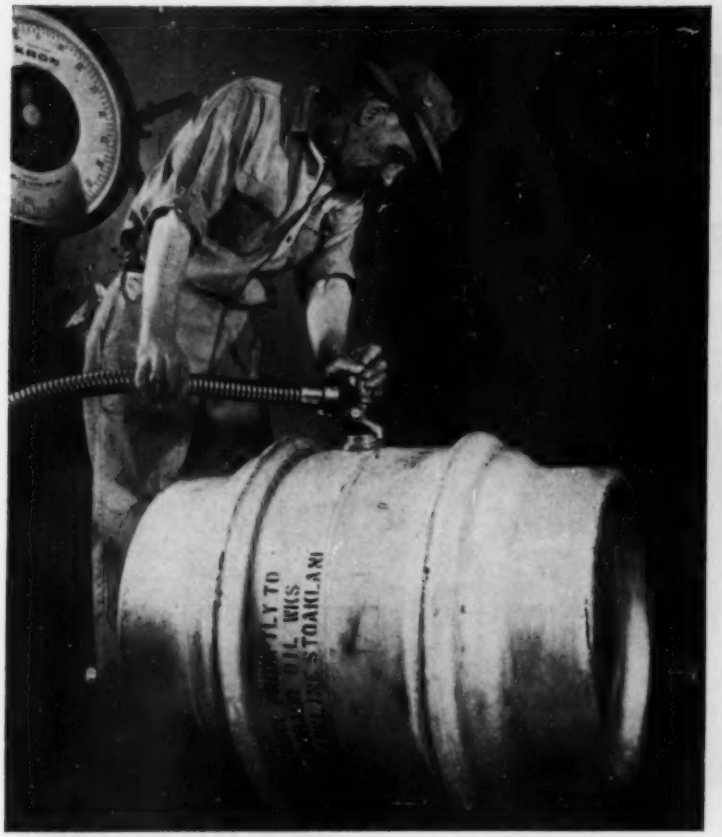
As emulsifiers in such products as surface coatings.

In adhesive compounds such as wallpaper paste.

In metal cleaning and de-greasing preparation.

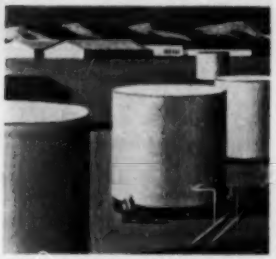
ORONITE CHEMICAL COMPANY

38 SANSOME ST., SAN FRANCISCO 4, CALIF. — STANDARD OIL BLDG., LOS ANGELES 15, CALIF.
30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y. — 600 S. MICHIGAN AVENUE, CHICAGO 5, ILL.
MERCANTILE SECURITIES BLDG., DALLAS, TEXAS



EL DORADO OIL WORKS also tried stainless steel drums, but adopted returnable aluminum drums of the same capacity because they cost only half as much. They weigh only half as much, which cuts shipping costs!

RETURNABLE ALUMINUM drums have high resistance to corrosion—have no lining to break, no glass to shatter. And they're stronger than standard steel drums, will last longer.



STORAGE TANKS and railroad tank cars are among other applications of aluminum that have high corrosion resistance, minimum tendency to contaminate, longer life!

THIS DRUM TAMED CAPRYLIC ACID

Caprylic is coconut oil's most corrosive, "toughest-on-containers" fatty acid. It is seriously discolored on contact with iron and many other metals.

El Dorado Oil Works, Oakland producers of various coconut oil fatty acids, formerly shipped caprylic acid in one-trip, plastic-lined steel drums. But they had to be quick about it, for the acid attacked the plastic lining in from 30 to 45 days, which resulted in contamination and discoloration of the acid.

Two years ago El Dorado switched to Benson drums made of Kaiser Aluminum, and got these dollars-and-cents benefits:

Aluminum drums withstand corrosion so effectively without lining that caprylic acid can be stored by El Dorado and its customers indefinitely—with no effect on color or quality.

Because aluminum drums are re-used again and again, expense of buying or reconditioning one-trip drums has been eliminated.

Benson Aluminum Drums are made of Kaiser Aluminum by Benson Manufacturing Company for Kaiser Aluminum & Chemical Sales, Inc., acting as sales agent.

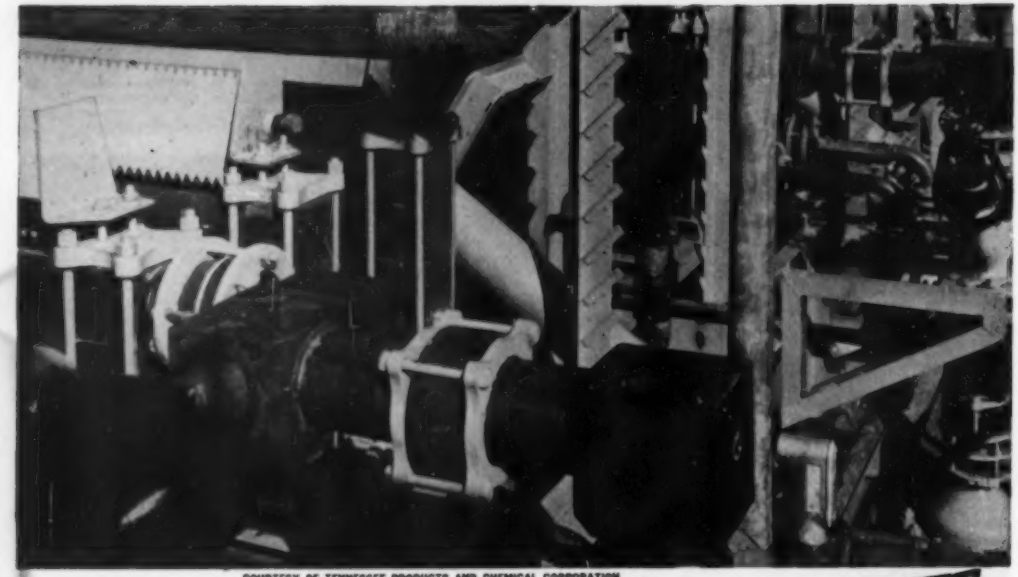
CALL ANY OFFICE of Kaiser Aluminum & Chemical Sales, Inc., for more information! Your Classified Telephone Directory lists the office nearest you.

Kaiser Aluminum

Setting the pace—through quality and service

QUESTION:

What pipe handles ALL corrosives?



COURTESY OF TENNESSEE PRODUCTS AND CHEMICAL CORPORATION

ANSWER:

"KARBATE" BRAND IMPERVIOUS GRAPHITE

For conveying, processing and storing *all* types of corrosive liquids and gases, hot or cold, whole systems are now being built 100% with "Karbate" impervious graphite pipe, fittings, valves, pumps, heat exchangers, towers and other units needed. Here are the reasons:

★ **When you use "Karbate" impervious graphite, you don't need to use a variety of corrosion-resistant materials.**

★ **"Karbate" impervious graphite pipe keeps production rolling. You don't have costly "down time" because of corrosion in the system. There is no loss of product.**

PLUS FACTORS OF "KARBATE" IMPERVIOUS GRAPHITE PIPE:

- Both acid resistant and alkali resistant
- Light in weight, easy to machine and assemble
- No metallic contamination of product
- Immune to thermal shock

The terms "Karbate" and "Eveready" are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

WHY BUY THIS ITEM?
It gives you *double the usable light!*
It's *leakproof!*
It can't *stick, swell or jam!*
It delivers the *whitest, brightest light!*
It's the "Eveready" No. 1050 flashlight battery, made with the zinc electrode inside a carbon jacket — just the reverse of every other battery on the market.
Test it and . . . you always buy it!

OTHER NATIONAL CARBON PRODUCTS

HEAT EXCHANGERS • PUMPS • VALVES • PIPING • TOWERS • TOWER PACKING • BUBBLE CAPS • BRICK • STRUCTURAL CARBON • SULPHURIC ACID CUTTERS • HYDROCHLORIC ACID ABSORBERS

Materials of Construction vs. Hydrogen Peroxide

NOTE: *We present first a revised article by J. S. Reichert and R. H. Pete, E. I. du Pont de Nemours & Co., Niagara Falls, N. Y., which appeared originally in the April, 1947 Corrosion Forum. This is followed by short articles by other authors. These deal with materials not covered by Mr. Reichert and Mr. Pete.*—EDITOR.

SUCCESS in manufacturing, shipping and applying hydrogen peroxide solutions in the commercial field depends largely on the selection of proper structural materials for processing equipment. Use of improper materials may lead to corrosion of equipment and also to accelerated decomposition and waste of hydrogen peroxide. Structural materials for handling and applying peroxide solutions must be considered a special problem for each particular set of conditions. One which performs very satisfactorily under one set of conditions may prove entirely unsuitable under other conditions.

From comprehensive studies of the various metals and nonmetals to determine their resistance to the corrosive action of hydrogen peroxide and also to determine the effect of these materials on the stability of hydrogen peroxide solutions, it is evident that there are very few structural materials which are suitable for handling peroxide solutions under practically all conditions of manufacture, storage and use. In most cases, it is the effect on the stability of the peroxide solution which is the governing factor in choosing compatible structural materials.

Pure solutions of hydrogen peroxide are inherently very stable. When carefully purified and kept in clean, unreactive containers, the rate of decomposition is extremely slow. In general, the stability of very pure hydrogen peroxide increases with the concentration.

Decomposition into water and oxygen is accelerated by a wide variety of catalysts. Among the more active and commonly encountered catalysts are lead, manganese, copper and iron. A slight trace of catalytically active material (parts per billion) will noticeably accelerate decomposition. Obviously, under commercial operating conditions such minute traces of catalytic materials, ever present in the surrounding atmosphere and in the walls of containing vessels, cannot be kept from entering the hydrogen peroxide solutions. Catalytic decomposition can, however, be inhibited by adding certain stabilizers to the solution. To be effective, a stabilizer must completely deactivate the catalytic materials and must continue to function for the life of the peroxide.

In the following discussion each of the structural materials is handled separately. Due attention is given to inhibitors along with a description of the conditions under which the various materials will perform most satisfactorily.

Aluminum

Aluminum in contact with solutions of hydrogen peroxide is subject to two kinds of corrosion which must be inhibited or kept to a minimum. Uniform dissolving of the aluminum is kept at a minimum when the hydrogen peroxide is stabilized at the midpoint of the titration curve, or "neutral point." Corrosion is accelerated in both acid and alkaline solutions. The dissolving of aluminum by hydrogen peroxide at a pH below the neutral point is inhibited by pyrophosphate. The other type of corrosion which occurs, localized pitting, can be prevented by the addition of nitrates.

In order to prevent catalytic decomposition the aluminum should be 99.6 percent pure and free from foreign matter which may be embedded in the surface or included in the weld deposits. Before placing aluminum equipment in service it is necessary to pickle thoroughly with 35 to 42 percent nitric acid to remove all surface impurities. This pickling operation is critical and must be performed correctly. A peroxide storage tank will improve with age; this conditioning or aging effect may possibly be due to the build-up of an oxide film by the peroxide.

Aluminum which is 99.6 percent pure is being used for fabrication of shipping drums and storage tanks where contact with the hydrogen peroxide is over an extended period of time. For pipes, fittings, and tank cars where contact with the peroxide is for short periods, 99 percent aluminum is acceptable. Gas welding on aluminum equipment should be done with an oxyhydrogen flame, using 99.6 percent aluminum welding rods and a suitable flux. Shielded arc welding is being used satisfactorily with a 99.6 percent aluminum welding rod without flux; argon and helium supply the shield.

Stainless Steel

Chrome-nickel steels, such as 304, 347 (columbium stabilized), 316 (containing molybdenum) and 316 Cb (columbium stabilized and containing molybdenum) are very resistant to corrosion by hydrogen peroxide under a wide range of conditions, i.e., neutral, acid and alkaline. However, these alloys have a mild catalytic effect on peroxide decomposition and are not generally recommended for long time storage of concentrated solutions. With strong solutions the loss in strength due to catalytic decomposition in stainless steel containers is likely to be appreciable under average storage conditions. With more dilute solutions of hydrogen peroxide (8 percent or less) stainless steel containers have been giving good performance. Stainless steel storage equipment should be pickled with nitric acid before use with hydrogen peroxide.

Stainless steel, with its excellent physical characteristics and its resistance to corrosion, is an excellent structural material for use with hydrogen peroxide solutions of strengths as high as 50 percent (and possibly higher) when contact with the solution is of short duration, e.g., in valves, pumps and pipelines. Stainless steel is also excellent for tanks and agitators for preparing dilute peroxide bleaching solutions and for tanks, vats and other equipment for bleaching operations.

Recent additions to the stainless alloys are the extra low carbon content stainless steels known as Types 304-ELC and 316-ELC. The ELC grades are ideal for welded equipment because the low carbon content in these steels eliminates harmful carbide precipitation during welding. Therefore, welded structures made of these types do not require annealing to avoid intergranular corrosion at weld areas.

Tin

Metallic tin is passive toward neutral and slightly acid solutions of hydrogen peroxide in concentrations up to 50 percent and possibly higher. It

(Continued)

How Williams can help YOU improve the performance of Automotive Priming Coats

As you know, the life and beauty of automotive top coats depend largely on the quality of your priming coats.

Water-resistance, adhesion, hold-out, shrinkage, gloss and durability . . . these are the essential qualities of priming coats which enable enamel top coats to retain original beauty despite years of wear.

To help you obtain these qualities, Williams is prepared to supply you with iron oxide pigments CUSTOM-MADE to the requirements of your coating system. These CUSTOM-MADE pigments . . . in combination with your carefully prepared vehicles . . . can often substantially improve the performance of your primers, primer-surfacers and surfacers.

If you have a primer problem . . . now, or in the future . . . please write Dept. 3, Easton, Pa. Our technical service laboratories will gladly cooperate with you in working out a good solution.

WILLIAMS
COLORS & PIGMENTS
C. K. WILLIAMS & CO.
Easton, Penna. • Emeryville, Cal. • E. St. Louis, Ill.

108 Shades and Types of Iron Oxide Pigments

is corroded by alkaline solutions. Corrosion of tin by alkaline peroxide solutions is inhibited by the addition of sodium silicate. However, commercial sheet tin frequently has particles of iron scale or rust embedded in the surface which, if allowed to remain, will accelerate decomposition of the peroxide. The limitations in the physical characteristics of tin restrict its use; however tin is giving good performance in pumps, pipelines, tank linings, and other equipment.

Tantalum

Tantalum is a suitable structural material for use with hydrogen peroxide under a very wide range of conditions as far as peroxide stability and resistance to corrosion are concerned. It has the disadvantage of high cost. However, there may be conditions when its initial high cost is offset by satisfactory service over a long period of time.

Lead

Under most conditions lead is susceptible to corrosion in contact with hydrogen peroxide. Lead is a very active decomposition catalyst in solutions where lead oxide can readily be formed. In lead equipment corrosion of the metal and catalytic decomposition are inhibited to some extent by addition of sodium silicate. Lead-lined tanks are being used successfully in the process for bleaching raw wool where sulphates are present to form lead sulphate instead of the catalytically active lead oxide.

Iron

Iron equipment is satisfactory only under special conditions and then only with quite dilute alkaline solutions. Iron is subject to corrosion by hydrogen peroxide and is a fairly active catalyst for peroxide decomposition. When properly conditioned, such as coating with sodium silicate, corrosion of iron equipment is negligible in dilute alkaline solution. Under these conditions iron equipment is giving excellent performance in many bleaching installations.

Copper, Copper Alloys

Copper is a very active decomposition catalyst and is also subject to corrosion. Copper equipment is therefore unsatisfactory under practically all conditions. Brass and bronze, like copper, do not give good performance. In some cases the copper in alloys does

(Continued)

The Durco Type F Valve

DURCO'S "one-plant manufacture" means "one-plant responsibility"

All DURCO equipment—pumps, valves, pipe, fittings—are DURCO-made from start to finish in a modern, well equipped plant. From casting to finished product, the job is ours and the responsibility to our customers is undivided.

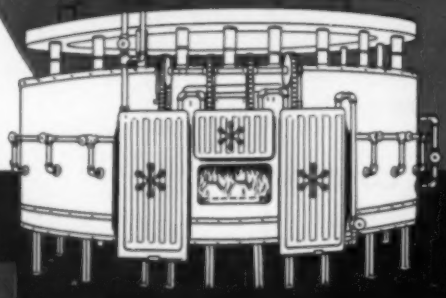
Your nearest DURCO representative is trained to find the solution to your corrosion problems and to help you get the most from DURCO equipment now in your plant.

THE DURIRON COMPANY, INC.
DAYTON 1, OHIO

DURCO
CORROSION RESISTING ALLOYS EVERYWHERE

in the plant of a
PROMINENT MOTOR CAR
MANUFACTURER

PLATECOILS
replace
pipe coils
as a Heat Shield for a
Rotary Hearth Furnace



and improve working conditions
cut maintenance costs
save down time

The unique application of Platecoils as a heat shield for a Rotary Hearth Furnace has resulted in many cost-saving advantages for a prominent motor car manufacturer.* It is no longer necessary for operators to leave work every half hour as was formerly done. The Platecoils cool so much more efficiently than the pipe coils previously used that working conditions have been greatly improved.

Then too, the pipe coils would occasionally rust through, necessitating shut down of the entire department. Use of Platecoils has eliminated these shut-downs and effected savings of several hundred dollars yearly in maintenance costs alone. Although the original cost of Platecoils is greater, they will pay for themselves many times over in the next few years.

Whatever your tank heating or cooling requirements, Platecoils will give you greater efficiency and dependability . . . at less cost to you. Get the facts today, send for bulletin No. P61.

*Name on request

PLATECOIL gives YOU these ADVANTAGES

Cleaned and Repaired Without Dumping Tank Solution
Greater BTU Transfer Per Unit Area
Weighs Only Half as Much as Pipe Coil
No Threaded Joints in Tank
Increased Tank Capacity
Fast, Easy Installation
Easy to Clean

PLATECOIL
Division
KOLD-HOLD MFG. CO.
LANSING 4, MICHIGAN

not act as copper and its catalytic effect is not so pronounced. Monel metal, which contains 30 percent copper is being used successfully for some textile bleaching operations.

Rubber, Plastics, Coatings

Most ordinary rubbers do not give satisfactory performance in contact with high strength hydrogen peroxide. The peroxide solution causes deterioration of the rubber and thus limits its useful life. The deterioration of the rubber is accompanied by acceleration of peroxide decomposition. Rubber hose has been used for dilute alkaline peroxide solutions, but the useful life of the hose is shortened to a period of one to two years. Natural rubber, as well as some synthetic rubbers, such as neoprene, may be specially compounded for use with hydrogen peroxide.

There are a few plastics which can be used for tubing and gasket material with dilute and concentrated hydrogen peroxide; among these are some of the polyvinyl chlorides, Teflon, polystyrene, polyethylenes, and copolymers such as Tygon and Saran. In general, coating materials are not satisfactory for use with concentrated hydrogen peroxide. The failure of most coating materials is due to the penetration of the peroxide through the coating to the base container where gas bubbles peel off the coating.

Wood

Wooden tanks and pipes made of cypress and pine are fairly satisfactory for dilute peroxide solutions under many conditions. However, even dilute peroxide solutions, especially at high temperatures and high alkalinities, swell and soften wood fiber, which shortens the life expectancy of wooden tanks to four to six years. For most satisfactory use, wooden tanks should be constructed with a concrete or tile bottom.

Transite and Concrete

Transite tanks and pipes are suitable for use with mildly alkaline, dilute peroxide in bleaching processes, particularly when sodium silicate is present in the bleaching solution. No adverse reaction between Transite and peroxide has been encountered over several years' use under these conditions. Concrete, like Transite, is suitable for use with dilute, alkaline solutions of hydrogen peroxide, particularly in bleaching solutions containing sodium silicate. Concrete equipment has been

giving very satisfactory performance under these conditions.

Transite and concrete are not recommended for use with high strength hydrogen peroxide.

Nickel & Nickel Alloys

W. Z. Friend, *International Nickel Co., New York, N. Y.*

Nickel, Inconel and Monel are highly resistant to corrosion by neutral and alkaline hydrogen peroxide solutions. Inconel also is resistant to some acid solutions but nickel and Monel would be attacked by acid peroxide solutions. All three materials commonly are used in connection with alkaline peroxide bleaching processes in textile mills.

Nickel and Inconel have only very slight catalytic effect upon decomposition of pure hydrogen peroxide and can be used satisfactorily for handling all concentrations in a large variety of applications. They would ordinarily not be used in preference to high purity aluminum for storage and shipment of concentrated hydrogen peroxide solutions where exposure may be for long periods and maximum resistance to decomposition is desired. Monel, because of its copper content, has significant catalytic effect upon decomposition of strong peroxide solutions so that its use usually is limited to weaker solutions as in alkaline peroxide bleaching.

High-Silicon Irons

Walter A. Luce, *Duriron Co., Dayton, Ohio*

The high-silicon iron alloys show a remarkable ability to adjust themselves to highly oxidizing conditions through the formation of a stable, corrosion-resistant film and for this reason would be expected to show good resistance to hydrogen peroxide solutions. In the concentrations tested to date this is actually the case. Once this film is formed, corrosion becomes practically negligible.

Duriron pumps and valves have found application for handling commercial concentrations of bleach with excellent service being reported. In addition to the pure hydrogen peroxide solutions, the high-silicon irons can be used for handling this corrosive in the presence of other destructive chemicals. For instance, pumps made from the molybdenum-containing Durichlor alloy were purchased for alternately handling a solution of glutamic acid and a combination of hydrogen peroxide plus glutamic acid hydrochloride. The latter solution con-

(Continued)

ASK ANY QUALIFIED AND IMPARTIAL AUTHORITY. . . HE'LL TELL YOU . . .

YOUR *BEST* PROTECTION
FOR FLAMMABLE LIQUID, GAS AND ELECTRICAL FIRES

ANSUL
DRY CHEMICAL
FIRE EXTINGUISHING EQUIPMENT

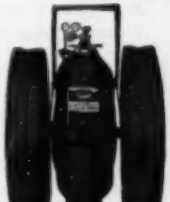
You, who have seen or used an Ansul Dry Chemical Extinguisher at a fire demonstration or on an actual fire, quickly recognized its superior fire-fighting capabilities. Further investigation proves that Ansul "Water-tight Construction" provides greater dependability under severe exposure conditions.

Ansul Hand Portable Models — 4, 4-B, 20-B and 30-B.

Fire Chiefs, insurance inspectors, safety engineers, etc. recognize Ansul as the leader in the dry chemical extinguisher field. Ansul Fire Extinguishing Equipment and *"PLUS-FIFTY"* Dry Chemical have set unparalleled standards of quality for the fire extinguisher industry.

You get *complete* dry chemical fire protection only from Ansul. There is an Ansul Dry Chemical Fire Extinguisher of the proper size for almost every flammable liquid, gas and electrical fire hazard.

Safeguard your plant and irreplaceable equipment with the *BEST* fire extinguishing equipment available. Protect them with ANSUL EXTINGUISHERS.



Ansul Wheeled Portable Models — 150-A and 350-A.

ANSUL EXCLUSIVE FEATURES

- Patented Nozzle assures most effective stream pattern . . . Best results by inexperienced operators.
- Special packings in Nozzle and other parts exclude water.
- Corrosion resistant construction throughout.
- Easy on-the-spot Recharging (No tools needed).
- Quick, *positive* puncture operation.
- Special guard protects cartridge . . . rugged construction throughout.
- Ansul *"PLUS-FIFTY"*® Dry Chemical used exclusively.
- Field tested by thousands of satisfied customers.
- Ansul LT Models are the only dry chemical extinguishers listed by U.L. for operation at −65° F.

Ansul Mobile Units—Mine Cars, Trailers, Jeep Equipped and Fire Trucks.

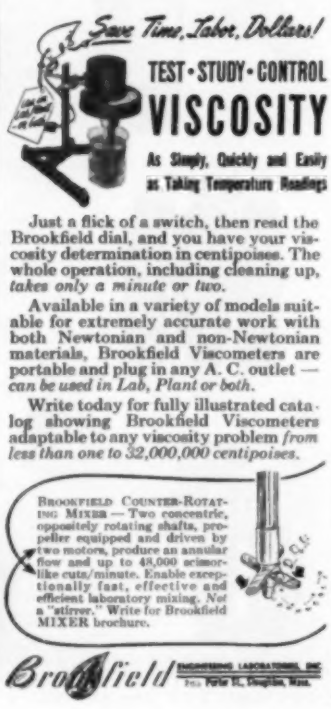
Ansul Piped Systems and Stationary Units.

Send for File No. 734. You will receive a variety of helpful printed matter. Included is our latest catalog which describes Ansul Extinguishers of all sizes — from the small Ansul Model 4 to Ansul Piped Systems and Ansul 2000 lb. Stationary Units.

ANSUL
CHEMICAL COMPANY
Fire Extinguisher Division
MARINETTE • WISCONSIN

DISTRIBUTORS IN ALL PRINCIPAL CITIES IN THE U. S. A., CANADA AND OTHER COUNTRIES

Corrosion Proof
Construction Materials
Corrosion Proof CEMENTS
A complete line of sulfur base, resin base, plastic and silicate cements. Write for bulletin 5-1.
Corrosion Proof FLOORS
Permanent floors for chemical process, steel, textile, food industries, etc. Write for bulletin 3-1.
Corrosion Proof LININGS
Corrosion proof linings based on natural rubber, neoprene, saran, polyethylene, etc. Write for bulletin 4-1.
PROTECTIVE COATINGS
Time-tested coatings based on vinyls, styrene, neoprene, saran, phenolics, furfuryl alcohol polymers, etc. Write for bulletin 7-1.
Rely on Atlas' years of experience and recognized leadership to help solve your problems. Write 10 Walnut Street, Mertztown, Pa.
Over a half century of service
Atlas
MINERAL PRODUCTS COMPANY
MERTZTOWN, PA. HOUSTON, TEXAS


Save Time, Labor, Dollars!
TEST • STUDY • CONTROL
VISCOSITY
As Simply, Quickly and Easily as Taking Temperature Readings
Just a flick of a switch, then read the Brookfield dial, and you have your viscosity determination in centipoises. The whole operation, including cleaning up, takes only a minute or two.
Available in a variety of models suitable for extremely accurate work with both Newtonian and non-Newtonian materials, Brookfield Viscometers are portable and plug in any A. C. outlet — can be used in Lab, Plant or both.
Write today for fully illustrated catalog showing Brookfield Viscometers adaptable to any viscosity problem from less than one to 32,000,000 centipoises.
BROOKFIELD COUNTER-ROTATING MIXER — Two concentric, oppositely rotating shafts, propeller equipped and driven by two motors, produce an annular flow and up to 48,000 scimitar-like cuts/minute. Enable exceptionally fast, effective and efficient laboratory mixing. Not a "stirrer." Write for Brookfield MIXER brochure.
Brookfield
ENGINEERING LABORATORIES, INC.

tained a substantial amount of free hydrochloric acid. The selection of Durichlor was the result of many tests on various materials of construction.

Use of the high-silicon iron alloys has been restricted by the good service shown by such alloys as aluminum, stainless steel, and for specific services, cast iron and steel. Unlike these latter two materials, however, Duriron shows low corrosion rates without close control of the solution and it shows good resistance to a great variety of other corrosives which are sometimes present with the hydrogen peroxide.

Glass Lining

S. W. McCANN, *Pfaudler Co., Rochester, N. Y.*

A number of glass-lined units have been used for low concentration of hydrogen peroxide and have given entire satisfaction. There is some meager evidence, however, that high strength hydrogen peroxide is slowly decomposed in contact with some glass linings. This phenomenon occurs with no visible attack on the glass. This matter is now under investigation and it is believed that glass linings can be developed that will not have an adverse effect on high strength hydrogen peroxide.

Worthite

W. E. PRATT, *Worthington Pump and Machinery Corp., Harrison, N. J.*

As long ago as 1939 Worthite pumps were used for handling H_2O_2 bleaching solutions and within more recent years a large number of installations of Worthite pumps have been made for this service—mostly in cotton textile mills. Worthite contains three times the nickel content of the 18-8 stainless steels. The presence of a small amount of copper in Worthite was one thought to be harmful, as copper is a very active decomposition catalyst. However, with many years of satisfactory performance to prove otherwise, Worthite is now recognized as one of the best materials for handling H_2O_2 below 50 percent concentration.

Since the 18-8 stainless alloys are suitable for H_2O_2 and are lower in cost, the question arises as to why Worthite pumps are used so widely. The reason is that the volume of Worthite pumps produced is so much larger than could ever be developed in the 18-8 alloys, due to the much wider application of Worthite in the handling of corrosive solutions, that

(Continued)

WHERE WILL THEY ATTACK IN YOUR PLANT?

MACHINERY STORED OUTDOORS
Problem Corrosion
Answer Insul-Mastic Vinyl System

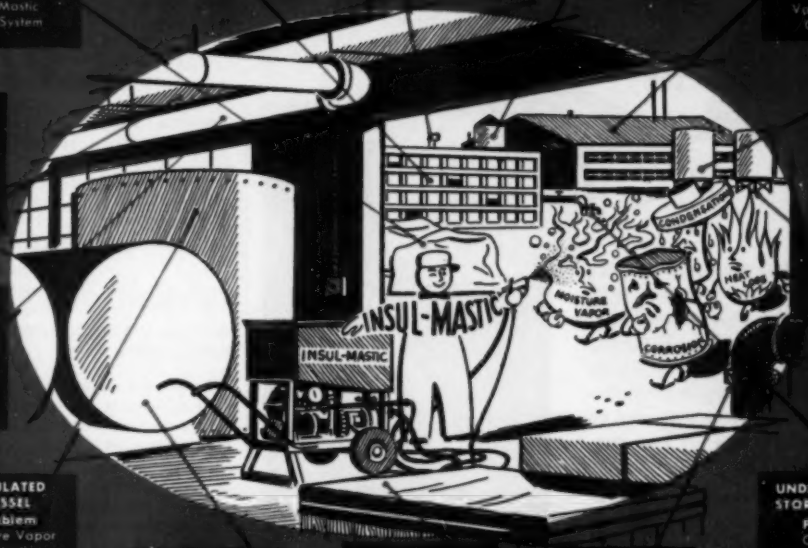
LEAKING WALLS
Problem Moisture
Answer Insul-Mastic Vaporseal & Granules

CORROSIVE VAPOR OUTLET
Problem Corrosion
Answer Insul-Mastic Vaporseal

WATER TANK
Problem Corrosion
Answer Outside—Insul-Mastic Vaporseal
Inside—Insul-Mastic Vinyl

LEAKING ROOF
Problem Moisture
Answer Insul-Mastic Vaporseal & Granules

WARM AIR DUCT
Problem Heat Loss
Answer Insul-Mastic Type "D"



MODERATE TEMPERATURE STORAGE TANK
Problem Heat Loss and Corrosion
Answer Insul-Mastic Type "D"

INSULATED PIPE
Problem Moisture Vapor Penetration
Answer Insul-Mastic Vaporseal

STRUCTURAL STEEL
Problem Corrosion
Answer Insul-Mastic Vaporseal

INSULATED VESSEL
Problem Moisture Vapor Penetration
Answer Insul-Mastic Vaporseal

ACID TANK
Problem Corrosion
Answer Insul-Mastic Vaporseal

CRATES AND CARTONS FOR OVERSEAS SHIPMENT
Problem Moisture and Salt Air
Answer Insul-Mastic Packaging Glues

COLD WATER INTAKE PIPE FOR BOILERS
Problem Condensation
Answer Insul-Mastic Type "D"

UNDERGROUND STORAGE TANK
Problem Corrosion
Answer Insul-Mastic Vaporseal

PROTECT YOUR EQUIPMENT WITH
INSUL-MASTIC
COATINGS OF UNEQUALED QUALITY

You can't select a heavy coating of better quality than Insul-Mastic. Its ingredients were specially chosen for their stubborn resistance to acids, alkalis, weather and wear. Insul-Mastic is homogenized for smooth spraying without blobs or pinholes. *Write today for our catalog.*

Think first of the coatings that last!

Insul-Mastic Corporation
OF AMERICA
1156 OLIVER BUILDING · PITTSBURGH 22, PA.
Representatives in Principal Cities

INSUL-MASTIC COATINGS
CORROSION PROOFING
WATERPROOFING
VAPOR SEALING
INSULATION

- Vacuum and Pressure Filter Element Covers
- Dust Collector Tubes, Bags and Envelopes
- Anode Bags

Let US make up your Element Coverings from NFM Filter Media

NFM Filter Media are woven from Nylon, Orlon*, Vinyon N**, Saran, Glass and Cotton. This wide range insures your obtaining the type of element covering having the greatest degree of chemical resistance and best general all round performance for your particular operation.

NFM element coverings are accurately and durably fabricated by skilled personnel at both our New Haven and Salt Lake plants. Experience has demonstrated that filter cloth costs are at a minimum and filter performance at a maximum wherever NFM products are employed.

If you are not absolutely certain as to which type of synthetic or natural fiber is best for your use send us a complete description of your operating conditions and we'll be glad to make a recommendation. Our many years of experience mean that we have quite a fund of knowledge always at your disposal.

*TM—UCC
**TM—E. I. Du Pont de Nemours & Co., Inc.

Weavers of Industrial Filter Media for over Forty Years

NFM The National Filter Media Corp.

General Offices & Mills: New Haven 14, Conn.
Western Office & Factory: Salt Lake City 1, Utah

Sales Offices—Representatives

Chicago, Ill. 2627 West 19th St. | Cincinnati, Ohio Boulevo Center Bldg. | Houston, Texas 1466 Second National Bank Bldg. | Oslo, Norway Nicolai Frils | Johannesburg, South Africa Edward L. Bateman

the production cost on Worthite pumps is lower. This also means that Worthite pumps are always available and in a very wide range of sizes.

Silicones

J. A. McHARD and LEON VAN VOLKINBURG, *Dow Corning Corp., Midland, Mich.*

Data on the resistance of silicones to hydrogen peroxide are limited almost entirely to aqueous 3 percent solutions. Isolated examples of use at higher concentrations are known. From the slim data available the silicones show generally good resistance to the dilute aqueous reagent. Concentrated hydrogen peroxide forms an explosive mixture with almost all organic materials. Because all of the silicones contain organic radicals, their use in contact with concentrated hydrogen peroxide should be preceded by careful testing in actual service.

Chlorimets

WALTER A. LUCE, *Duriron Co., Dayton, Ohio*

Very little testing has been done with Chlorimet 3 in hydrogen peroxide solutions, but because of its high chromium content, good resistance can be expected. However, the fact that other less highly alloyed materials of construction are very suitable for this corrosive makes the use of this alloy economically impracticable. Chlorimet 3 is particularly designed for use on severe services and is usually used where other commercial alloys are not suitable. Hydrogen peroxide is not in this category.

Chlorimet 2 contains no chromium and would provide poor resistance to a highly oxidizing corrosive like hydrogen peroxide. Therefore, it should be given no consideration when this corrosive is encountered.

Carbon & Graphite

W. M. GAYLORD, *National Carbon Co., Cleveland, Ohio*

In the opinion of a producer of hydrogen peroxide by the potassium persulphate process, impervious graphite is the most satisfactory material for the tube and shell heaters and coolers handling the 25 percent ammonium persulphate — 20 percent sulphuric acid solutions encountered in this process. Cell covers in this process are made of carbon slabs (*Chem. Eng.*,

ed for handling solutions containing hydrogen peroxide because there is evidence they catalyze the decomposition of hydrogen peroxide in all concentrations.

Cements

RAYMOND B. SEYMOUR, *Atlas Mineral Products Co., Mertztown, Pa.*

Cements based on polymers of furfuryl alcohol and silica-filled phenolic cements are badly attacked by hydrogen peroxide at room temperature and are not recommended for such service. Carbon-filled phenolic cements are sufficiently resistant at room temperature to permit the use of this cement for joining brick or tile in floors exposed to spillage of 3 percent hydrogen peroxide but carbon-filled phenollics are not recommended for continuous exposure to hydrogen peroxide. Obviously, cements based on blends of polymers of furfuryl alcohol and phenol-formaldehyde are not suitable. However, a commercially available modified phenolic cement is resistant even to 30 percent hydrogen peroxide at room temperature.

While little actual service data are available, all tests indicate that plasticized sulphur cements are satisfactory for joining brick and tile in floors exposed to all concentrations of hydrogen peroxide. Silicate cements are not recommended unless the solution is on the acid side. A new plastic cement recommended for mild oxidizing solutions is not attacked by long exposures to 30 percent hydrogen peroxide at room temperature and should be considered for such service.

Durimet 20

WALTER A. LUCE, *Duriron Co., Dayton, Ohio*

Durimet 20 appears to offer no advantage over the conventional 18-8-S Type stainless steel for handling the common hydrogen peroxide solutions since it does not contain any additional chromium over the lesser alloy. Nevertheless, Durimet 20 has found application for handling many commercial bleach solutions. Its normal application has been in the form of pumps and valves.

Numerous tests have been conducted on Durimet 20 in bleach solutions. Results in concentrations up to 27.5 percent showed no measurable weight loss or product contamination after a five-week test period. Another test on a more dilute solution showed similar results for a test duration of over one year. These results are indicative of the resistance of this alloy to hydrogen peroxide. —*End*

HERE'S WHY **TILCO-FIN CUTS THE COST OF HEAT TRANSFER AS NO OTHER FIN TUBING CAN!**

EXCLUSIVE!
• segmented fins
• fused metal shoulder
MOVE TWICE AS MUCH HEAT*
per unit of surface as any other type of fin tubing!

See how much TILCO-FIN will save in your plant

SURE, fin tubing is the best way to handle most heat transfer operations. Cost data from dozens of industries prove it—over and over again.

The important thing is to get the *best* fin tubing.

Cost data and independent testing provide a positive answer here, too—TILCO-FIN!

Millions of feet of this cost-cutting tubing are in use today, *setting economy records* for waste heat steam generators, air-cooled jacket water exchanges, air-cooled condensers, air-cooled lube oil coolers, gas heaters and coolers, instrument enclosure heaters, blast coils for space heating and cooling.

You can get all of Tilco tubing's exclusive advantages on large jobs or small, a tailor-made installation that will *transfer twice as much heat per unit of surface!* The fused shoulder eliminates costly heat loss due to interfaces of dirt, air and corrosion common on other types of tubing. It's a rugged, welded fin bond that *will not break!*

Chemical and Power Engineers Valuable New Handbook FREE!

Get all the facts about this modern way to multiply your savings on heat transfer jobs. This newest fin tubing reference source puts everything you need to know about extended surface equipment right at your fingertips in accurate easy-to-use form. Just clip the coupon below to your letterhead and mail today!

*Proved in independent comparison tests by Norris and Spofford, Transactions of the ASME, July 1942

TILCO-FIN DIVISION, Kentile, Inc.
58 2nd Ave., Brooklyn 15, N. Y.

Please send me, without charge or obligation, a copy of the Tilco-Fin Tubing Handbook.

Name_____

Firm_____

Street_____

City_____ Zone_____ State_____

[illegible] 16-page, file-size booklet. Tells you how to choose and use fin tubing to best advantage. Includes data tables, graphs, charts, nomograms.

Chemical Progress

News of developments from General Electric's Chemical Division that can be important to *your* business.

G-E PLASTICS IMPROVE REFRIGERATOR "DOORS WITHIN DOORS"

This G-E laminated plastics sheet becomes an efficient refrigerator "inner door."

The development of superior resins and varnishes for the plastics laminating industry is one contribution of General Electric's chemical research.

Large refrigerator manufacturers are using General Electric laminated plastics for refrigerator "inner doors"—with advantages to both themselves and their customers. By using lightweight plastics (instead of metal) they benefit by easier handling during assembly, reduced shipping charges and less scrap loss.

The greater design flexibility of plastics makes possible a better-looking, more salable product. And refrigerator users get a lighter, quieter, "non-slamming" door with excellent insulating qualities.

G-E CHEMICAL PRODUCTS SPEED NATIONAL DEFENSE

Plastics-laminated and insulating products are prominent among G-E contributions to the defense effort. Among them are:

G-E 1201 Glyptal® Red Enamel—an insulating, sealing and finishing enamel which offers great protection to motor windings under severe service conditions.

A full line of plastics laminates—either molded or in the form of sheets, tubes and rods—with cloth, paper, glass fabric or special bases for a wide variety of applications.

A complete line of insulating products—silicone insulation, insulating varnishes, sealing and filling compounds, mica insulation, varnished cloths and tapes.

® Reg. U. S. Pat. Off.

NEW SILICONE INSULATION

General Electric silicone insulating resins are being specified by manufacturers when electrical equipment is to operate at high temperatures, or subject to frequent overload conditions. This new Class H insulation has a temperature range between 120-160 F. above that obtainable with conventional insulating materials.

WANT MORE INFORMATION?

For more details about any of the G-E chemical products mentioned on this page, just write to Chemical Division, General Electric Company, Pittsfield 15, Massachusetts.

PLASTICS COMPOUNDS • SILICONES • INSULATING MATERIALS • GLYPTAL® ALKYD RESINS • PLASTICS LAMINATING, MOLDING, AND EXTRUDING

You can put your confidence in

GENERAL ELECTRIC

For

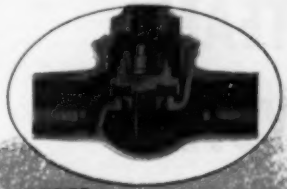
EASY INSTALLATION
POSITIVE CONTROL
LASTING ECONOMY
in copper line service

JENKINS *Solder-End* VALVES

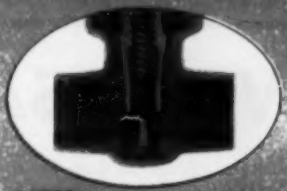
To speed installation in copper lines, you want a valve with an accurate fit to tubing—a valve that will not distort under the intense heat of soldering. And, because flexible tubing does not afford the rigid support of standard pipe, you want a valve that will withstand unusual strains in operation.

To give you Solder End Valves that meet *every* test in the toughest service Jenkins valve specialists designed them with an extra measure of rugged endurance, along with the dimensional accuracy and operating efficiency you expect in all valves of Jenkins quality.

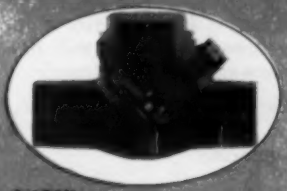
A new Folder, Form 198, describes the complete line of Jenkins Solder End Valves, shows construction details, and gives instructions for correct installation. Get your copy—see why so many economy-wise valve buyers specify *Jenkins*. Jenkins Bros., 100 Park Ave., New York 17. Jenkins Bros., Ltd., Montreal.



GLOBES 300 lbs. O.W.G. ¼" to 3" Fitted with Jenkins Renewable Composition Disc for any specified service.



GATES 225 lbs. and 300 lbs. O.W.G. ¼" to 3" With solid or split wedges, and stationary or traveling spindles.

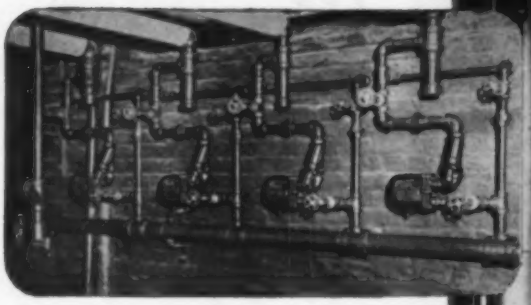


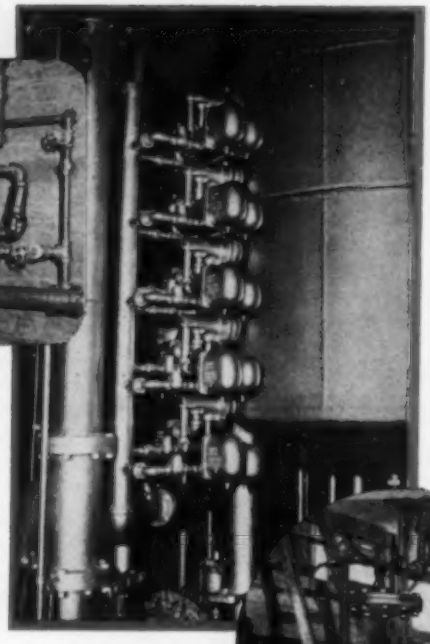
CHECK 300 lbs. O.W.G. ¼" to 3" Regrinding. May be easily reground without removal from line.

GET THIS New FOLDER ON JENKINS Solder End VALVES
Gives complete description, dimensions, and instructions for installation. Ask your Jenkins Distributor or write for Form 198. Jenkins Bros., New York 17.

JENKINS VALVES

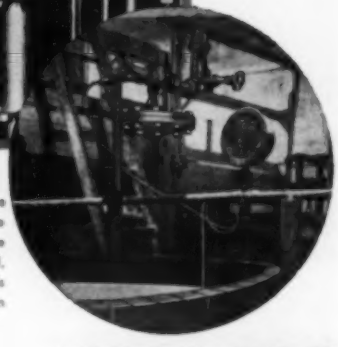
First we make sure of hot, dry steam at the inlet.





Then we select the best of four distinct types of steam traps to remove all condensate without steam waste.

GET YOUR STEAM SYSTEM *Rationalized* WITH SARCO



If automatic temperature control is indicated, Sarco can choose from a wide range of self-operated, pilot or electric controls to do the job at minimum cost.

Operating a steam process with maximum efficiency is more than buying a few steam traps and air vents—it is more than haphazardly applying a few temperature controls.

If it means dollars to you in increased production, improved quality and fewer rejects—it will pay you to let the Sarco man near you make a survey of your needs.

He will come up with definite, practical suggestions of how you can do a better job and save steam besides. Write today—there is no obligation.

The new Sarco draining and venting system for dry cans will save at least 20% warm-up time.

307

SARCO SAVES STEAM

SARCO COMPANY, INC.

Represented in Principal Cities

Empire State Building, New York 1, N. Y.

SARCO CANADA, LTD., TORONTO 5, ONTARIO

IMPROVES PRODUCT QUALITY AND OUTPUT

Photo courtesy Standard Oil Co. (N. J.).

Your One Page Reports Can Really Say Something

To many engineers report writing is a necessary evil. It is necessary but it needn't be an evil. Here's a common sense approach that can save you time and effort.

Sure you hate to write reports. Most engineers do. In fact, the thought of putting himself in writing appeals to the average engineer about as much as the thought of using a slide rule would appeal to a Saturday Evening Post editor.

Yet the difference between a first-rate report—one that reflects an engineer on his toes—and a run-of-the-mill job that clearly says "this was a chore," can be only a matter of removing that mental block, learning firmly how to apply a few rules of common sense.

REMOVE THAT MENTAL BLOCK

Dale Carnegie[1] says that the way to lick worry is to resign yourself to the inevitable. You can apply this technique to writing reports because, in any responsible job, you have to live with them. In fact, you can often measure the responsibility a man carries by the amount of report writing he does. As the authors of the book, *Report Writing*[2] point out: The President reports to the stockholders; The General Manager reports to the President; the Superintendent reports to the General Manager; the engineering department reports to the Supervisor; the assistant engineer reports to the head of his department.

APPRECIATE THEIR IMPORTANCE

To some men, your reports are you. Some superiors judge you chiefly by what you write and how you write it. These men usually base their report on yours. Obviously the better your report is, the easier their job will be. Eventually, many an assistant engineer's report shows up in some form or other in the President's Report to the Stockholders.

SOME COMMON SENSE RULES

Below are listed a few common sense rules based on experience and the advice of the experts. If you heed this advice, you probably won't like to write one whit more than you do now, but you can't help doing a better job and chances are you'll be doing it in less time.

MAKE IT SHORT

Never write a long report when a short one will do. The exception to this rule is when writing for the records. The "master" or final report on a piece of research should be comprehensive. As Zeisberg[3] points out in Perry's *Chemical Engineers' Handbook*, for permanent records it is better to err on the side of including too much rather than too little. In most cases, though, it's a good idea to remember the parishioner who, after the first five minutes of the Pastor's plea for donations, was ready to give all he had. After the next five minutes, he decided to donate half the money in his pocket. After 20 minutes he decided to contribute a nominal sum, and when finally the collection plate was passed after a 40-minute harangue, he took five dollars out of the collection.

Keep short words, short sentences, short paragraphs throughout your report whether formal or informal. If you're in doubt about the reading ease and clarity of your report, apply the formula developed by Rudolf Flesch[4] to a few paragraphs. It'll keep you "on course."

It's not unprofessional to write and speak simple, direct language. It takes a whale of a lot more skill (and courage) to make a statement in simple, direct, concise, accurate and convincing terms, than it does to couch a report in academic verbiage. A word of caution, though. Keep a note of restraint in your reports. That means you neither want to present a picture of a smart-aleck know-it-all, nor do you want to be what Phil Swain (*You and Your Job*, August, 1951, p. 230) calls a self-effacing, tongue-tied technologist.

KEEP IT INFORMAL

Never write a formal report when an informal one will do, and if a formal report is indicated, keep it only as formal as company policy and the particular problem demands. Learn how to distinguish important facts from idle circumlocution. Then learn how to pack half-a-dozen facts into one terse sentence.

After your formal report is written, boil it down to a one-pager with your recommendations at the top followed

(Continued)

New POTTER *Electronic*
FLOWMETER *and* TACHOMETER

Improved design eliminates

★ BEARING MAINTENANCE
★ HIGH PRESSURE DROP
★ BEARING FRICTION

The improved Potter Electronic Flowmeter (patent pending) combines extreme accuracy with freedom from maintenance. This new design eliminates thrust bearings, high pressure drop, and bearing maintenance.

The Potter Flowmeter comprises a flow sensing unit having a hydraulically balanced rotor and magnet rotating within a compact non-magnetic housing, and an external pickup coil connected to an electronic integrator or totalizer, or both.

ACCURATE within ±½%

Since the novel, high-efficiency rotor spins in a freely balanced position within a venturi, its blades operate with practically no slippage. Fluid viscosity, pressure, temperature, and specific gravity only slightly affect the volumetric flow rate. Accuracy is guaranteed within ±½%. Electric impulses from the rotor are conducted to a combination electronic integrator and totalizer. Rate of flow can be read or recorded either directly or remotely, and total flow is indicated on a resettable magnetic Veeder-Root counter.

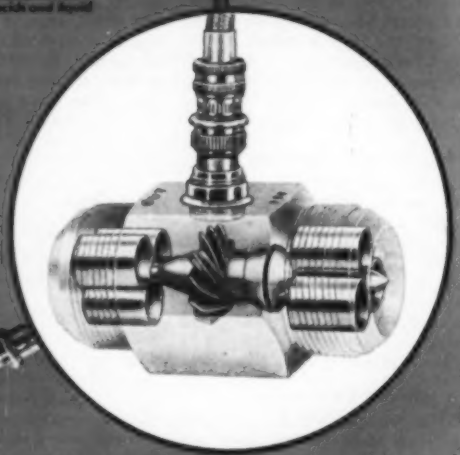
We will gladly help you solve your flow measuring problems.

APPLICATIONS

Potter Flowmeters accurately measure flow. Especially suitable for highly corrosive liquids, gases, acids and liquid oxygen.

SEND FOR NEW BULLETIN 1050

which gives full information, pressure drop chart, ranges, sizes, and operational data.



POTTER AERONAUTICAL CO. 79 Academy St., Newark 2, N. J.

YOU AND YOUR JOB, cont. . .

by all of the facts you can cram into that page to back up your recommendations. Then attach this page to your formal report and let it stand in place of the summary. Formal summaries usually tell what was done rather than what was *found*, and, as such, are valueless.

IMITATE THE EXPERTS

Study the reports, memos, letters, and speeches (self-written) of the top executives in your own company and in other companies and other industries. You'll find the top executive uses words that any eighth grader can understand. Robert Oppenheimer, the physicist and one of the best minds in the world was asked, after the last war, to explain the need for basic research, something that lesser men have taken thousands of words to cover. His answer was a classic. "When the war began," he said, "we had a tree full of ripe fruit. For five years now, we've been shaking that tree."

Not all of us have the gifts of an Oppenheimer, but we can learn much from imitation, so let's go back and take a closer look at some of the things a top executive does in his writing.

He comes right to the point. He makes direct statements and stands behind them. That's the secret of his poise, and poise inspires confidence.

Rudolf Flesch speaks of the pompous language of lesser clerks. Don't put yourself in this category.

AIM AT YOUR AUDIENCE

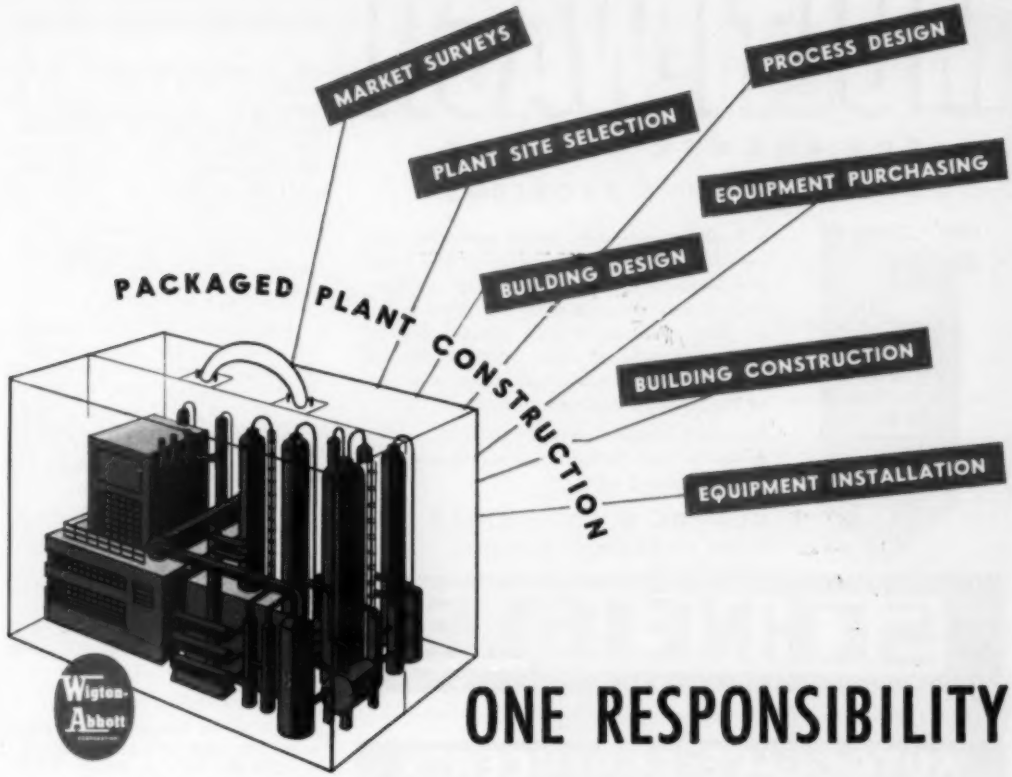
Who is going to read your report? Is he familiar with the work you're doing? If he is, don't cover the same ground twice. It wastes the time of at least two people. This is especially true when writing a progress report. Don't include background data that will be repeated later in a final report

Ask yourself *why* your superior is reading your report, your survey, your observations. Is he trying to decide the feasibility of entering a new field? Or will he have to decide whether to build a new plant? Anticipate his needs and get to the heart of the matter early in your report. Then he won't have to leaf through twenty pages looking for the information he needs. Incidentally, some of the strongest recommendations don't recommend anything at all. They just marshal the facts in such a way that only one conclusion is possible.

DON'T PUT THE JOB OFF

If your company doesn't maintain a schedule of regular reporting, don't take that as an excuse to put the job

(Continued)



ONE RESPONSIBILITY

Pass along the burden of details. When you entrust Wigton-Abbott Corporation with the entire project of new construction, expansion or remodeling your present plant facilities, you set in motion a smoothly functioning organization that assumes complete responsibility.

This single, important decision eliminates confused planning, costly "trial-and-error" waste, time-consuming negotiations, involved scheduling and heart-breaking disappointments.

"Packaged Plant Construction," a complete service from planning to production, is designed to put your proposed plant into full operation at top speed, with maximum economy. Wigton-Abbott Corporation's service includes 7 basic elements — market surveys, plant site selection, process design, building design, equipment purchasing, building construction and equipment installation. You may avail yourself of this service in its entirety or turn the job over to Wigton-Abbott Corporation at any stage for completion.

To perform and to coordinate these complex functions, Wigton-Abbott Corporation employs the experience and skill of engineers and architects—including specialists in all branches of chemical, mechanical, electrical, civil and industrial engineering. The Construction Department is staffed and equipped to erect any type of industrial plant.

A Wigton-Abbott Corporation representative will be glad to consult with you on any phase of plant design and construction.

● *Yours for the asking*

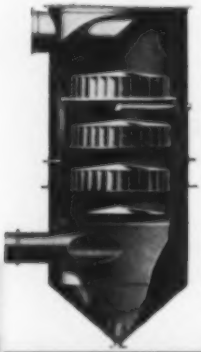
"Packaged Plant Construction". Reading time, only 10 minutes — but it will save you many hours by answering basic questions.

Wigton-Abbott Corporation

DESIGNERS...ENGINEERS...CONTRACTORS...PLAINFIELD, NEW JERSEY

MULTI-WASH

THE ANSWER TO YOUR DUST AND FUME PROBLEMS



Schneible engineers have perfected the method for control of your dust and fume problems with the Multi-Wash System. Multi-Wash takes in dust and fume laden air and replaces it with clean—washed air at the rate of from 1000 to 36,000 cubic feet per minute depending upon size of Multi-Wash Collector required.

For more detailed answers to your specific problems call the local Schneible engineer or write direct to

CLAUDE B. SCHNEIBLE CO.

P.O. BOX 502, ROOSEVELT ANNEX, DETROIT 32, MICHIGAN

SCHNEIBLE

AUTOCLAVE ENGINEER'S

*Magne Dash**

HIGH PRESSURE AUTOCLAVE

1. No Stuffing Box
2. Magnetically Operated Agitator
3. Positive Agitation
4. Adjustable Timer to Vary Agitation Cycle
5. No External Moving Parts
6. Internal Parts Type 316 Stainless
7. Furnished with Thermocouple Well and 4 Connections
8. Available in 100cc—250cc —500cc—1000cc Sizes
9. Pressure Rating—5,000 P.S.I.

WRITE FOR BULLETIN 1851

*Licensed by Standard Oil Company of Indiana-Patent Pending

AUTOCLAVE ENGINEERS, INC.

860 EAST 19th STREET • ERIE, PENNSYLVANIA

LABORATORY & PILOT PLANT HIGH PRESSURE EQUIPMENT

EXPORT DEPT 751 • DREXEL BLDG • PHILADELPHIA 6, PA.

off. If you wait until you're in the middle of a new research project to write up the old one, your report will probably be of much less value. Memory is wonderful but memories can play funny tricks on us—and the older an event becomes the dimmer our recollective powers become. Even the best notes become disjointed and obscure as any engineering sophomore studying for a final exam knows.

SUGGESTIONS ARE VALUABLE

Another argument against delaying your reports is that the opportunity for suggestion is lost. Oftentimes we become so busy analyzing the bark on the trees, we forget the existence of the forest. Writing a good report allows us to back off for a moment and get the forest back in perspective.

Then we can ask ourselves, "How can this or that technique be improved?" "What was wrong with that filtration step?" "Did we make that same mistake last week?"

Sometimes an honest hour's cogitation can be worth two or three hours of hit-or-miss test-tubing. Ask Einstein. He does his hardest work staring into space.

MAKE YOUR REPORT DO ITS JOB

If it is the job of your report to make one recommendation, don't list a dozen alternatives.

If you're writing for non-technical management, don't try to impress your readers with your technical knowledge. Sure you'll impress them—the wrong way.

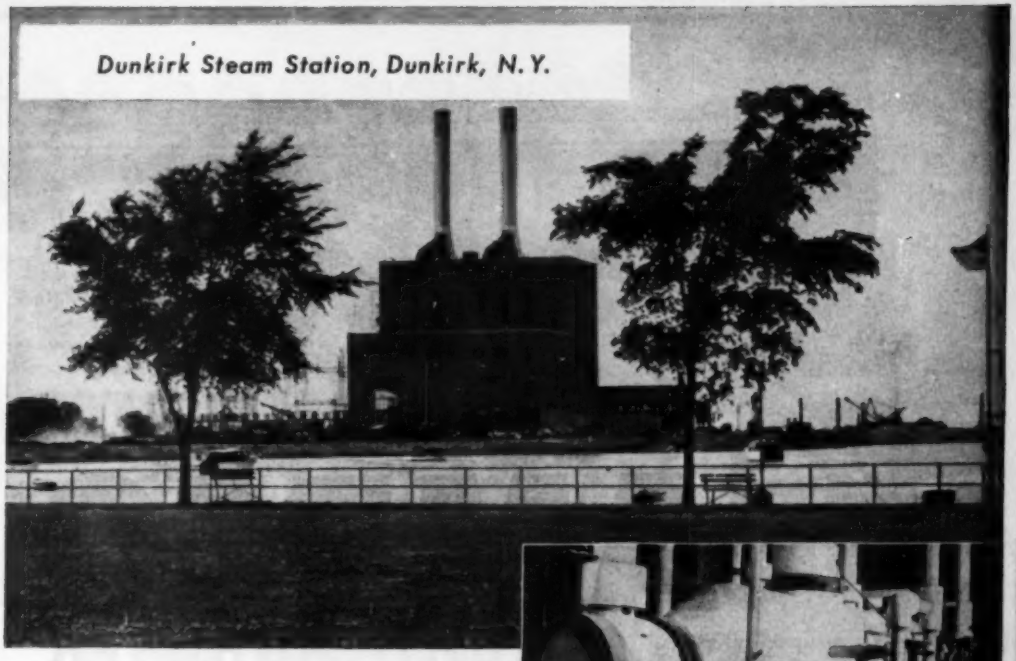
If you're making a literature search, list only pertinent information. Don't send the reader back to the library for material that you've dug up already. He could have done the job himself more easily than going back over the ground you covered the first time.

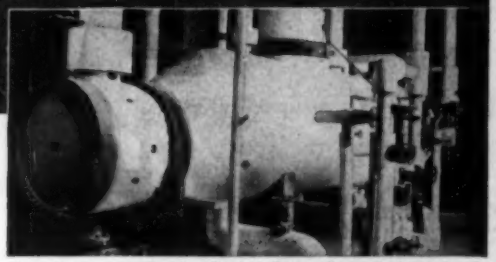
A list of "don'ts" is easier to write than read so let's sum it up by repeating what we said at the beginning. Reports are written to do a job. Ask yourself, "What is the job of my report?" Then do everything you can to make it do that job.

It's all common sense, but with the pressure of getting jobs done in a hurry these days we all find common sense a little uncommon.

REFERENCES

1. Carnegie, Dale, *How To Stop Worrying and Start Living*, Simon and Shuster, New York, (1948).
2. Gaum, C. G., Graves, H. F., and Lyne, S. S. H., *Report Writing*, Prentice-Hall, New York, (1950).
3. Perry, John H., *Chemical Engineers' Handbook*, p 2,956, 2nd. Ed., McGraw-Hill, New York, (1941).
4. Flesch, R., *The Art of Plain Talk*, Harper and Brothers, New York, (1946).
5. Flesch, R., *The Art of Readable Writing*, Harper and Brothers, New York, (1949).





ALCO Evaporator on the job at Dunkirk. Extracted steam is delivered to the tubes at 72 psia and 285° superheat to produce 16,400 pounds per hour of net vapor.

How Alco Evaporators give this station High purity make-up water

Typical of the effective engineering which keynotes the design of this 160,000 kw plant of the Niagara Mohawk Power Corporation, are the two ALCO evaporators, each of which furnishes 20,000 pounds per hour of high purity make-up water for the two 80,000 kw generating units.

These single-effect evaporators are of the ALCO patented "Flextube" thermal descaling type. Each evaporator contains 586 square feet of effective heating surface comprising 80-20 Cupro-nickel tubing, and uses a centrifugal type vapor purifier. Maximum working pressure for the shell side is 100 psig; for the tube side, 150 psig.

Other ALCO equipment in this new station includes high pressure extraction feedwater heaters, drain coolers, and evaporator condensers—all playing an important part in maintaining peak efficiency in this reheat cycle plant.

Check these other ALCO *Evaporator design features:* ample vapor disengaging space . . . separate, removable channel and cover . . . patented ALCO compression bolting. All add to the effectiveness of the evaporator. Write now for more details, or call the nearest ALCO Sales Engineer at Chicago, Houston, Kansas City, Los Angeles, New York or Tulsa. Plants: Dunkirk, N. Y. and Beaumont, Texas.

ALCO

ALCO Products Division

AMERICAN LOCOMOTIVE COMPANY

In step with tomorrow—ALCO AIRCOOLERS, Heat Exchangers, Evaporators, Feedwater Heaters, Pressure Vessels, Pipe

DEPENDABLE
under severest conditions of dust and dirt!

DODGE-TIMKEN

- Even under layers of grime, dirt and abrasive dust encountered in many production operations, the Dodge-Timken Type C bearing carries its power load smoothly, efficiently, without interruption—because it's
- Triple-sealed to prevent the entry of dust, however fine. Accurately machined steel seals keep dirt *out* and lubricant *in*.
- Dodge mounts, seals, houses Timken precision bearing units in rugged assemblies (four different types) to deliver a minimum of 30,000 hours uninterrupted service.
- Dodge Timken Type C Pillow Blocks are fully self-aligning, with both radial and thrust carrying capacity.
- Delivered fully assembled, adjusted and lubricated, ready to lock on shaft. Locking collars at both ends insure firm fastening.
- Normally available from Dodge Distributors' stocks, sizes from 1-7/16" to 4-15/16".

DODGE MANUFACTURING CORPORATION, 200 Union Street, Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor for assistance on new, cost-saving methods. Look for his name under "Power Transmission Equipment" in classified phone book.

FIRST IN POWER TRANSMISSION MACHINERY!

V-BELTS AND TAPER-LOCK SHEAVES · TORQUE-ARM SPEED REDUCERS · ROLLING GRIP AND DIAMOND V CLUTCHES · SOLID STEEL CONVEYOR PULLEYS

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, CHICAGO THRIFT-ETCHING CORPORATION, 1555 SHEFFIELD AVENUE, CHICAGO, ILLINOIS

Names in the News Edited by Frances Arne

MAN OF THE MONTH: Mark E. Putnam

Concerning labor relations—"It's a mutual affair—you've got to have production or there can't be anything for anyone. A better understanding will bring better production results."

In addition, Mark Putnam, Dow's new executive vice president, went on to say that industry in general is making real progress in achieving friendlier relations between management and unions. Management is learning how to work with unions and vice versa.

Out in Midland, Putnam himself has had a hand in bringing this about. He climbed to his new post on the production side of the ladder—plant superintendent, division superintendent, production manager. But he never got used to being "boss." Patient, even-tempered, he always "teaches," taking great pleasure in helping assistants to grow. People want to do well in their work, he says. You give them opportunity and a little direction and they will do well. And he likes talking things over in a group. It all adds up to helping as many men as possible develop on their jobs, helping as many as possible do the work for which they are best fitted. When you've achieved that, he says, you've got cooperation, teamwork—and more production.

Putnam's own manner of working is a puzzle to less methodical colleagues. He has an intuitive feeling of how organic reactions should go. He never labors over anything, never worries. He just seems to walk around a problem a few times sizing it up before making straight for the solution. His desk is always clear.

His first job may be at the root of his teaching bent. Just out of the University of Michigan, he took an instructorship at Case School of Applied Science in Cleveland. He worked under A. W. Smith, head of the chemical engineering department and also a director of Dow Chemical Co. Through Smith Dr. Putnam met Dr. Herbert H. Dow. After that, he worked a couple of vacation periods at the Dow plant in Midland, then started full time on July 1, 1915.

Asked about his first day on the job, he said he went out to the plant area with Dr. Dow to find a place for him to work. Coming across an empty building, Dr. Dow told him to just go ahead and get a laboratory fixed up.

Continued on page 292

F. G. Gronemeyer. Chief engineer, Chemstrand's new nylon plant at Pensacola, Fla. Recently completed 22 years of service with Monsanto most recently as chief engineer of the organic division. Plant's new manager: **Roy G. Hemminghaus.** Formerly general manufacturing superintendent of Monsanto's John F. Queeny plant in St. Louis. With company for 20 years.

W. R. Dedert. General manager of production of Victor Chemical Works' phosphate plants. Has been in charge of production at all company phosphate plants since 1948. Started with Victor in 1922 as a chemist in the control laboratory. New general superintendent of phosphate plants: **H. B. Terry.**

C. W. Perry. Assistant manager of engineering and design, Wyandotte Chemicals. Formerly chief process engineer, Phillips Chemical Co.

Neil C. Elphick. Resident manager of Westvaco's new nitric acid plant being built for the government at the Sunflower Ordnance Depot, Kans. Has been assistant manager of the Carteret, N. J., plant. Joined Westvaco in 1941 after graduating from Clemson College.

Randal Maass. From assistant manager, Torrence, Calif., refinery, General Petroleum Corp., to assistant manager of Standard-Vacuum Petroleum Maatschappij's refinery at Palenbang, Sumatra. Joined General Petroleum as a laboratory technician in 1934. Graduate of California Institute of Technology.

Edward L. Conant. Plant superintendent, Victor Chemical, transferred from Morrisville to Chicago Heights. His successor: **Donald G. Frye,** formerly assistant superintendent.

J. R. Van Wazer. From senior scientist to assistant research director, Monsanto's phosphate division research department. Anniston, Ala. New division group leaders: **P. G. Arvan, W. W. Wade.**

Donald L. Katz. Chairman, department of chemical and metallurgical engineering, University of Michigan. With Michigan faculty since 1936 as assistant, associate and full professor of chemical engineering. Michigan graduate. From 1933 to 1936, researcher for Phillips Petroleum.

D. L. Katz

H. R. Gamrath

Harry R. Gamrath. Assistant Director of research, organic chemicals division, Monsanto. Came to Monsanto as a chemist in 1934. During World War II he was in charge of research for the Chemical Warfare Service plant operated at Monsanto, Ill. *(Continued)*

ARROW AH HART

EXPLO-SAFE

AND WEATHERPROOF

Motor Starters

APPROVED BY UNDERWRITERS' LABORATORIES

Modern-as-tomorrow EXPLO-SAFE Starters provide plus performance and added protection for both machine and operator in just ⅔ the space. Superior motor control for hazardous and exposed locations no longer requires bulky, old-fashioned equipment. Here are new opportunities for flexible layout and more compact control centers. A small starter in a roomy enclosure means more working space for fast installation and easy maintenance. New, straight-thru, front wiring makes all terminals and contacts easy to reach, easy to service. These remarkable advantages are possible only with Arrow-Hart's revolutionary "RA" design. Ingenious application of the time-tested bellcrank principles lets a much smaller magnet outperform the conventional direct-acting type. The result — greatly reduced starter size with increased operating efficiency. EXPLO-SAFE Feraloy enclosures are designed and built to provide the utmost safety in hazardous locations. These special alloy castings, possessing unusual corrosion resistance and high tensile strength, safely withstand great internal pressures. For additional information about EXPLO-SAFE Starters, write for the fully illustrated bulletin complete with dimensional and rating data.

SEND FOR THE "EXPLO-SAFE" BULLETIN **TODAY**

AH

THE ARROW-HART & HEGEMAN ELECTRIC CO.
INDUSTRIAL CONTROL DIVISION
2610 HAWTHORN ST., HARTFORD 6, CONN.

Please send me free copy of the bulletin featuring "EXPLO-SAFE" MOTOR STARTERS.

YOUR NAME_____

POSITION_____

CO. NAME_____

CO. ADDRESS_____

CITY_____ ZONE_____ STATE_____

NAMES IN THE NEWS, cont. . .

Wallace F. Armstrong. Manager of Ethyl Corp.'s new chemical plant under construction near Houston. For 12 years, member of the company's manufacturing department, most recently as superintendent of ethyl chloride operations. Graduate of the University of Florida.

James F. Eversole. Manager of research administration, Union Carbide and Carbon Corp. Since 1944, superintendent of Linde Air Products laboratories at Tonawanda, N. Y. Joined the Carbide organization as a research chemist in 1929.

J. F. Eversole

A. L. Taylor

A. Lloyd Taylor. Director of research, MacDermid Western, Incorporated, Ferndale, Mich. Comes from Wyandotte Chemicals Corp. where he was research supervisor. Other posts: director, department of chemistry, Pease Laboratories, New York; director of research, Oakite Products; vice president in charge of research and development, H. L. Shaw and Sons, Portsmouth, N. H.

E. D. Powers. Member, board of directors, American Cyanamid; continues as vice president in charge of production. New vice presidents: **A. J. Campbell,** general manager of the industrial chemicals division; **Howard Huston,** formerly assistant to the president.

Robert A. MacDonald. Head of the development department, plant food division, International Minerals & Chemical Corp. Has been a member of the research group at the corporation's potash refinery at Carlsbad, N. M. Served in research and chemical engineering capacities for Minnesota Mining & Mfg. Co. until joining IMC in 1947. Graduate of the University of Minnesota.

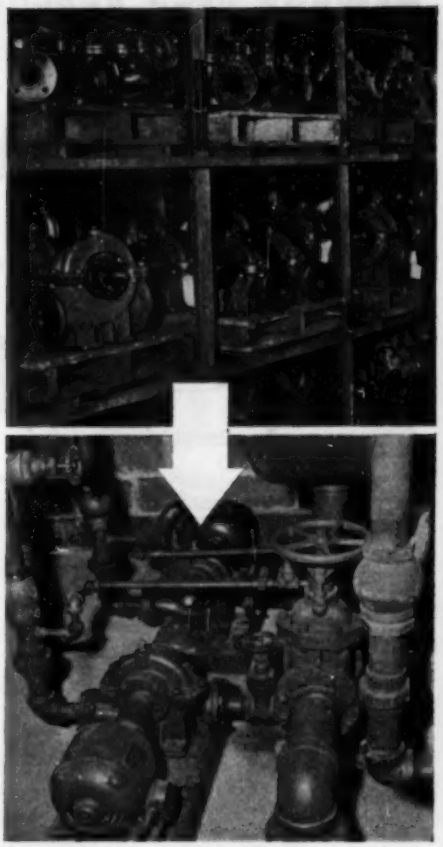
Robert C. Gunness. Vice chairman of the new policy group, research and development board, department of defense. With Standard Oil of In-

(Continued)

NEW DE LAVAL GS PUMPS

on their way to you in

2 WEEKS



From our shelf to your plant in two weeks! That's how fast you can get a standard centrifugal De Laval pump. We now have on hand GS pumps, motors and bedplates in sizes 2½", 3" and 4" ready for assembly and shipment. Capacities to 280 gpm, heads to 75 ft, at 1750 rpm. • Also available for immediate delivery are bare pumps in the same sizes with capacities to 400 gpm, heads to 230 ft, at 3500 rpm. We can assemble and ship these units within two weeks after receipt of the motor. • Want complete details quickly? Simply telephone or fill in the coupon and mail today.

Sales office phone numbers:

Allan J. Harris, New Orleans **RA-0228 • RA-0439**
Burford, Hall & Smith, Atlanta **Walnut 8890**
Central Station Equipment Co., Tucson, Ariz. **3-2493**
Commercial Engineering Co., Washington, D. C. **National 9238**
Commonwealth Electric Co., Minneapolis **Garfield 1836**
Dana E. Kepner, Denver **Main 0697**
Dravo Corporation, Cincinnati **Redwood 8446**
Dravo Corporation, Cleveland **HE 1-7500**
Dravo Corporation, Indianapolis **Reiley 1920**
Dravo Corporation, Philadelphia **Rittenhouse 6-8086**
Dravo Corporation, Pittsburgh **Express 1-2600**
Industrial Equipment Co., Detroit **Trinity 5-0950**
Lefler-Wyomont Supply Co., Billings, Mont. **9-4760**
Maris Engineering Service Co., St. Louis **Delmar 3846**
P. J. Patton, Milwaukee **Glenview 3-5496**
Purser & London, Charlotte **3-7549**
Riter Engineering, Salt Lake City **3-7933**
Roger Brown Co., El Paso, Texas **3-3089**
R. M. Sorlie Co., Kalamazoo, Mich. **2-3861**
Stapp Engineering Co., Denver **Acoma 3573**
Turbine Equipment Co., Boston **Liberty 2-5993-4**
Turbine Equipment Co., New York **WHitehall 4-1060**
Turbine Equipment Co., Rochester, N. Y. **Hamilton 7940-49**
Turbine Equipment Co., Glens Falls, N. Y. **2-3283**
Turbine Equipment Co., Westbrook, Conn. **Saybrook 473-J-3**
De Laval, Detroit **Trinity 1-8447**
De Laval, Kansas City, Mo. **Victor 0776**
De Laval, Houston **Fairfax 1175**
De Laval, St. Louis **Axminister 0441**
De Laval, Los Angeles **Michigan 0797**
De Laval, San Francisco **Sutter 1-3426**
De Laval, Seattle **Garfield 1718**
De Laval, Tulsa **4-3689**
De Laval, Chicago **Taylor 9-7732 or Harrison 7-3290**

50th DE LAVAL Anniversary

DE LAVAL STEAM TURBINE COMPANY
TRENTON 2, NEW JERSEY

DE LAVAL STEAM TURBINE COMPANY, TRENTON 2, NEW JERSEY

☐ *I'm in a hurry. Please have an engineer call me.*
☐ *I'm interested. Please send me literature.*

*Name*_____
*Company*_____
*Street*_____
*City*_____ *State*_____

NEWARK "End-Shāk" TESTING SIEVE SHAKER

Motion is important in making sizing tests. Conforms to recommendations for the motion to be used when making hand tests, issued by the Bureau of Standards.

Here, in the Newark "End-Shāk" unit, you get proper sustained hand motion mechanically. You get the best motion without being subjected to any human variation or weakness. This sturdy testing machine holds up to 7 full height sieves or up to 13 half height sieves. It is designed for 8 inch diameter sieves. Standard ½ HP., 110-220 volt 60 cycle, 1750 rpm motor supplied. Special motor to order.

We'll be glad to send you prices and descriptive literature. And if you will outline your testing requirements we'll be glad to suggest the proper sieve series to use.

NEWARK for ACCURACY

Newark Wire Cloth COMPANY

351 VERONA AVENUE • NEWARK 4, NEW JERSEY

Philadelphia 3, Penna. 9311 Widener Bldg. | San Francisco, Calif. 3100 19th St. | Chicago, Ill. 20 N. Wacker Dr. | New Orleans, La. 520 Maritime Bldg. | Los Angeles, Calif. 1400 So. Alameda St. | Houston, Texas P. O. Box 1939

NAMES IN THE NEWS, cont. . .

diana's research department since 1938, currently as manager of research activities. Doctorate in chemical engineering, MIT.

John V. Starr. Assistant manager of the lubricants and specialties division, manufacturing division, Esso Standard. Since 1946, technical assistant to the general manager of East Coast manufacturing operations at the Bayway, N. J. refinery.

J. V. Starr

C. F. Fryling

C. F. Fryling. To supervise special research projects for Koppers Co.'s research department. Since 1945, supervisor of polymerization research for Phillips Petroleum. Leader in the development of cold rubber. Other employers: General Electric, Illinois State Geological Survey, B. F. Goodrich Rubber Co., Office of the Rubber Director. Studied at Lafayette College, NYU and Princeton.

W. S. Harmon. Technical director, Hardesty & Co., Philadelphia. Has been with Merck's engineering and research departments.

Otto Aepli. Assistant to the chief chemist at Pennsalt's Wyandotte plant. With company since 1944 most recently as senior research chemist at the company's Whitemarsh Research Laboratories.

W. Cordes Snyder. President and chief executive officer, Blaw-Knox. Has been vice president of Koppers and manager of its metallurgical department. Former president **William P. Witherow** continues as chairman of the board.

Roy Clark. From chief chemist to secretary, Arner Co., Buffalo, N. Y. With the firm since 1925. Studied at the University of Michigan.

Albert D. Capuro. Dean of admissions, Polytechnic Institute of Brooklyn; former head of the department of engineering, evening division, Hofstra College, Hempstead, N. Y. Chemical engineering graduate of Lafayette.

Robert A. Collins. From assistant superintendent, Hercules Powder Co.'s Brunswick, Ga., plant, to the same post at Hattiesburg, Miss., plant. Joined Hercules in 1939 as a chemist. Graduate of the University of Georgia. New assistant superintendent at Brunswick: **John M. Eagan,** formerly area supervisor.

John R. Corrigan. Research associate, chemical development department, Sharp & Dohme. Formerly with Sterling-Winthrop Research Institute. Doctorate in organic chemistry, Notre Dame.

Charles H. Carter, Jr. Assistant general manager, industrial chemicals department, Atlas Powder Co.; has been manager, central research laboratory. With Atlas since 1936. Lehigh graduate. His successor in the laboratories: **John D. Brandner.**

Frederick J. Pilgrim. Chemical research manager, Groton, Conn., plant of Chas. Pfizer. Joined Pfizer in 1948. Previously with Lederle Laboratories for three years, then with Merck for three. New members of the chemical research and development staff at Pfizer's Brooklyn plant: **Franklin S. Chance, Jr.; Roger D. Smith; Carl W. Weil.**

Darrel E. Mack. From Lehigh's chemical engineering department to Imperial Paper & Color Corp. where he is technical director.

W. M. Ralph

W. Minnis

Walter M. Ralph. Assistant to the president, National Aniline Division, New York. Has been director of research and development for 22 years. Joined National Aniline at its formation in 1917. His successor: **Wesley Minnis,** for two decades assistant plant manager in charge of research and development at the Buffalo, N. Y., plant of the division.

E. C. Vierling, Jr. Assistant manager, protective coatings division, Pittsburgh Coke & Chemical Co. Previous employers: Howard Plastics

(Continued)

SPARKLER FILTERS · SPARKLER FILTERS

Quality . . . Filtration

SPARKLER FILTERS

High quality, sharp filtration has always been one of the prime features of Sparkler Filters. Many times Sparkler Filters have been chosen by experienced filtration engineers for this one point of superiority.

Here's why

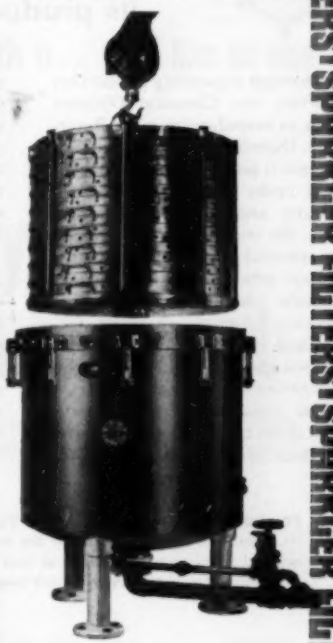
. . . any kind of filter paper, cloth, or screens, and any filter media can be used to obtain maximum efficiency.

. . . no breakage of the filtering surface even with intermittent operation as pressure is not required to hold cake in position on the horizontal plates.

. . . flow is always with gravity, down through the cake in a natural direction. The cake will not break, crack or slip because it is supported in a horizontal position and is not subject to tensile or distortive strain.

When you are looking for fine quality filtering, Sparkler Filters will do the job.

For personal engineering service write Mr. Eric Anderson.



Makers of Filters for the Chemical, Pharmaceutical, Food and Petroleum Industries for over a quarter of a century.

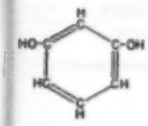
Sparkler representatives in all principal cities.

SPARKLER MANUFACTURING CO., Mundelein, Ill.

European plant: Herengracht 568, Amsterdam, Holland

SPARKLER FILTERS · SPARKLER FILTERS

More Resorcinol for Defense!



...Koppers expands its production facilities

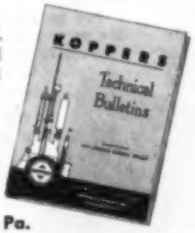
● Through expanding production facilities, our Chemical Division plans to manufacture more Resorcinol. Distribution of Koppers Resorcinol is now governed by Schedule 6 under NPA Order M-45.

Many end products, resulting from the reactions of Resorcinol, are essential to the defense effort. Typical products: explosives, medicinals, pharmaceuticals, woodworking adhesives, dyestuffs, textile and leather chemicals—plus compounds that make rubber adhere better to fabrics and cords.

The versatile nature of Resorcinol stems from its high reactivity; the three hydrogen atoms adjacent to the hydroxyl groups are particularly reactive. As a result, Resorcinol undergoes many interesting and unusual reactions in addition to those typical of phenol—reactions which may suggest new and undeveloped commercial possibilities to you.

Koppers Resorcinol is manufactured in two grades. Koppers Resorcinol, Technical, for most chemical manufacturing and processing use, is produced in flake form with a minimum purity of 98.5%. Koppers Resorcinol, U.S.P., for medicinal and pharmaceutical applications, is in the form of fine crystals with a minimum purity of 99.5%.

FOR FURTHER INFORMATION, send for Bulletin C-9-124. This Bulletin describes many of the interesting and unusual reactions of Resorcinol, as well as its physical properties, chemical properties and uses.



KOPPERS

KOPPERS COMPANY, INC.
Chemical Division, Dept. CE-10
Koppers Building, Pittsburgh 19, Pa.

and Monsanto Chemical Co., Carbide & Carbon Chemicals Division. Chemical engineering graduate of Carnegie Tech.

W. C. Rueckel. From vice president, engineering and construction division, Koppers Co., to manager, chemical division, Kaiser Engineers Division, Oakland, Calif. With Koppers for 16 years. Doctorate from Ohio State.

W. C. Rueckel

P. R. Shildneck

Paul R. Shildneck. Assistant technical director, A. E. Staley Mfg. Co.; has been research director since 1947. Inventor of the Staley process for making monosodium glutamate. Graduate of the universities of Nebraska and Illinois. New director of the technical service branch: **James P. Casey.**

Paul F. Steinhoff. Senior engineer, process engineering department, chemical plants division, Blaw-Knox. Previously with Proctor & Gamble. Chemical engineering graduate of Missouri School of Mines.

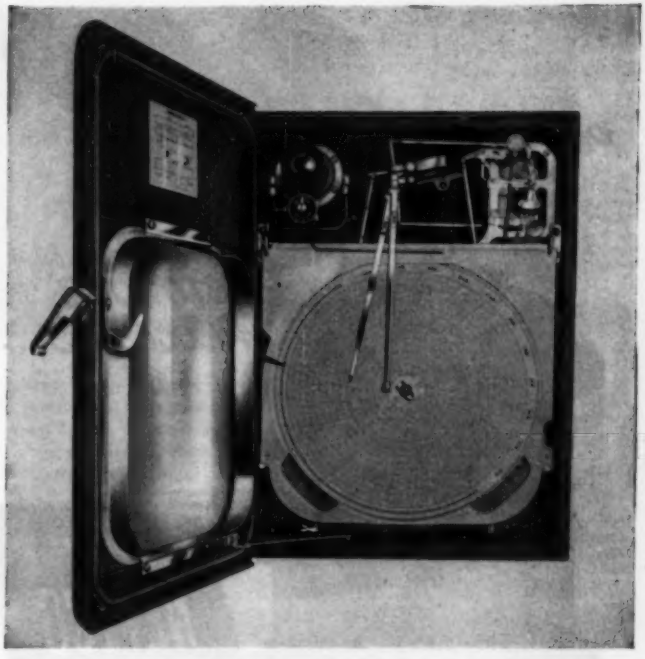
John A. Bolt. From assistant superintendent of technical service to division director, light oils and special products, Standard Oil Co. (Indiana) research laboratory at Whiting, Ind. He succeeds **Philip C. White,** who has become manager of research and development, Pan American Refining Corp., Texas City. New assistant superintendent at Whiting is **H. M. Hart,** formerly group leader in Standard's research laboratory at Sugar Creek, Mo.

Harry G. Mitchell. Recalled to his World War II post as chief, carbon products section, NPA. On indefinite leave from Speer Carbon Co. where he has been director of product development.

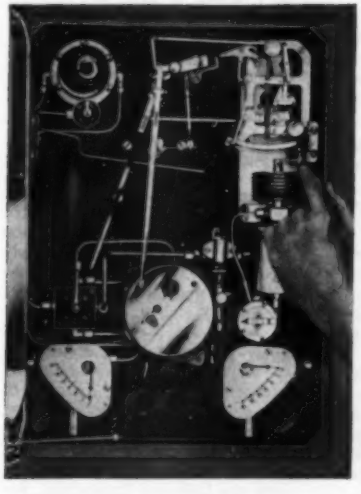
John B. Davidson. Associate director of research, Plaskon Division, Libbey-Owens-Ford. Joined division in 1950 as group leader in charge

(Continued)

Anybody Can Take Care of a BRISTOL SERIES 500 CONTROLLER



Plant operating men quickly become familiar with it... and like to use it



Only One Simple Adjustment

Write or call your local Bristol representative. And write for Bulletin A120. THE BRISTOL COMPANY, 109 Bristol Road, Waterbury 20, Conn.

BRISTOL

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Time is money in any processing operation and the sure way to step up the pace of your operations is to install NETTCO Engineered AGITATORS! Nettco offers the most complete line of drives and stirrers — ready-built to serve your exact needs. By combining the right components, our Engineers can give you agitation that's "tops" from every angle:

Bank of Nettco Model WT-11 Drives at American Reenforced Paper Co., Attleboro, Mass.

FIRST COST — Standardized components — drives, stirrers, baffles, accessories — save you money because they are quantity-produced to reduce manufacturing costs.

OPERATING COST — Nettco Agitators are custom-made from these standard components for each job . . . this means they save processing time and reduce processing costs.

UPKEEP COST — Nettco drives have heavy-duty bearings, shafts, gears, housings — and extra-large oil reservoirs. They're engineered to reduce maintenance, keeping moving parts to a minimum.

It will pay you to find out more about Nettco Agitating Equipment: the choice of leading process industries throughout the nation. Write for recommendations and data to NEW ENGLAND TANK & TOWER COMPANY, 87 Tileston St., Everett 49, Mass.

See Us ----------

at Booth 50 at the New York Chemical Show

NETTCO *Engineered* AGITATORS

NAMES IN THE NEWS, cont. . .

of silicone and industrial chemicals research. Formerly with Sharples for eight years.

Irvin M. Lefton. Director of research, Cook Chemical Co., Kansas City, Mo. Formerly sanitary engineer in charge of the Galveston County water pollution survey, Galveston, Tex.

A. J. Weith. Product supervisor, synthetic organic chemicals department, American Cyanamid. Joined Cyanamid's Stamford Research Laboratories in 1937; transferred to sales department in 1950.

John Mirza. New member of Sumner Chemical Co.'s research department. Has been with Rohm and Haas. Studied at DePauw and the University of Illinois.

J. T. McLaughlin. Assistant chief engineer, James P. O'Donnell, Engineers, New York. Chief project engineer: **R. A. Pickenbrock.**

Edward G. Samsa. Research chemist in the oils and protein laboratory, A. E. Staley Mfg. Co., Decatur, Ill. Studied chemical engineering at Feen College, Western Reserve, Iowa State. Previous employers: E. J. Brach & Sons and Armour Research Foundation.

Alexander N. T. St. John. Vice president in charge of planning and development, Resistaflex Corp., Belleville, N. J.; has been technical director and research engineer. New chief engineer: **Irving D. Press.** Chief chemist: **B. M. Walker.**

H. Gordon Smith. Executive vice president, U. S. Rubber, a newly created post. Formerly vice president and general manager, textile division.

Gregory J. Comstock. Recipient of the Certificate of Appreciation, Department of the Army. Director of the powder metallurgy laboratory, Stevens Institute of Technology. Has been connected with the Foreign Economic Administration and with the Office of Production, Research and Development.

William C. Geer. Winner of the Charles Goodyear Medal for outstanding achievements in the chemistry of rubber. Vice president in charge of research at B. F. Goodrich until 1925 when he retired to private research.

Proctor H. Avon. Division engineer, Monsanto's Merrimac Division. Harvard graduate, joined Monsanto in 1937. Successor to **John S. Hayes**, now assistant director, general engineering department.

Richard P. Porter. To work on agricultural chemicals on the product development staff, Ethyl Corp. Formerly assistant manager of the insecticide department, Innis, Speiden and Co.

M. E. Holmberg. Consulting engineer, specializing in metallurgy, with newly-opened offices in Houston. With Phillips Petroleum for the past 15 years, most recently as manager of the test division. Other employers: Black, Sivalls and Bryson; Aluminum Co. of America.

F. S. Washburn, President of American Cyanamid's Canadian subsidiary, North American Cyamid. Member of the board of directors and director of agricultural chemicals division for the parent company.

Richard A. Carrigan. Supervisor, analtical chemistry section, Armour Research Foundation. Has been on the faculty of the University of Florida.

M. H. Arveson. Director, Indoil Chemical Co., Standard Oil of Indiana subsidiary. With Standard since 1924 most recently as technical director of Indoil.

George M. Hebbard. Deputy chief of the inorganic and agricultural chemicals branch, Chemicals Division, NPA. On leave as vice president of operations and engineering, Davision Chemical Corp., Baltimore. Chemical engineer for Dow from 1933 to 1944. Doctorate from the University of Michigan.

Wayne A. Proell and A. W. Weitkamp. Research associates, Standard Oil (Indiana) research laboratory at Whiting. Mr. Weitkamp joined the company in 1937 as a research chemist, Mr. Proell in 1938.

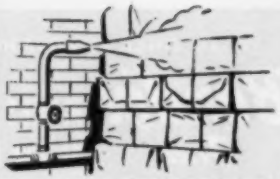
S. C. Ogburn, Jr. Vice president in charge of research and development, Foote Mineral Co., Philadelphia, has been manager of research and development. Previously with Pennsalt.

W. B. Wiegand. Resigned vice president of Columbian Carbon Co. Continues as a director and research consultant.

(Continued)

NO. 1 OF A SERIES ON HOW TO

Stretch a MULTIWALL Paper Bag



1. Let steam escape in bag storage room to keep air and bags humid. Keep a humidity indicator in the storage room and check it frequently. Always leave aisles or spaces between stacks of bags to allow circulation.

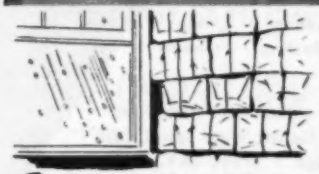
Kraft paper supplies are short. So it is important for you to get the best use from your multiwalls. Here is one way to stretch them . . .

Proper Storage of Empty Bags —Keep Storage Rooms Humid: Here are 6 Ways to Do It.

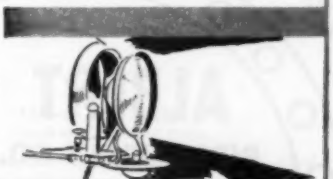
2. Store bags on dunnage, away from floor, and keep floor wet so moisture can be absorbed into air. A relative humidity of about 50% at warm temperature is best.

3. Drill small "needle" holes in horizontal water pipes. Hang cloths over holes. Air absorbs moisture from wet cloths.

4. Hang wet cloths over edge of water barrels. Cloth absorbs water and air absorbs moisture from cloth. Keep barrels well filled.



5. Open windows on damp or rainy day. Damp outside air will circulate in the bag storage room. Multiwalls are strongest when moisture content of the paper is about 6 or 7%.



6. Use commercial humidifying apparatus. Many types of commercial humidifiers are available with capacities to suit individual requirements.

Want the Whole Story?

Ask your Bemis Man for free, illustrated copy of Bemis Multiwall Packaging Guide. It deals with Storage, Filling and Closing, Handling, Palletizing and other important subjects.

• • •

Maybe Cotton Bags are Your Answer . . . if you can't get all of the multiwalls you need. Cotton bags are available . . . and Bemis is the leading cotton bag source.

Bemis

BEMIS BRO BAG COMPANY

St. Louis 2, Missouri

TO CHECK RELATIVE HUMIDITY REMEMBER

Bendix Friez MAKES the RIGHT INSTRUMENT at the RIGHT PRICE for EVERY JOB!

Model 185 Hygrodial Precision Humidity and Temperature Indicator

Hair-operated and calibrated to professional standards of accuracy by the maker of the world's finest weather instruments. Handsome, modern case—4" high, 5½" wide, 3⅛" deep.

Model HA/2 Hand Aspirated Psychrometer

Accurate readings obtainable without special skill. Psychrometric readings can be taken at any point desired however inaccessible.

Model 160 Portable Humidity and Temperature Recorder

9" x 5" charts, 10 or 30 hour records. Modern design...handy for small space and difficult locations ... built to meet unusual conditions.

Model 594 Hygrothermograph

The foremost relative humidity recorder for laboratory, factory, and office use. Scientifically designed for accuracy and dependability.

Model 573 Motor Aspirated Psychrometer

Designed to determine wet and dry bulb temperature with laboratory accuracy—Motors supplied for use on 115 V., 50 cycles or 60 cycles.

Model S/1 Pocket Sling Psychrometer

A small, low cost instrument. Thermometers graduated in 1° increments from +35° F to +110° F. Furnished complete with case and psychometric slide rule.

Model 550 Sling Psychrometer

Manufactured to U. S. Weather bureau specifications. Thermometers graduated in 1° increments from −20° F to +120° F, or −35° C to +49° C.

FRIEZ INSTRUMENT
DIVISION OF
1318 Taylor Avenue
Baltimore 4, Maryland

Bendix AVIATION CORPORATION

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.

SPECIALISTS in PIPE FABRICATING

TO MEET THE MOST EXACTING SPECIFICATIONS

Butt Welds • Bending All Types • Coiling Machining • Threading • Beveling • Lining Pickling • Galvanizing • Sand Blasting • Preheating • Stress Relieving • Testing.

PIPE—Wrought Iron—Steel • Structural Cast Iron Copper Steel • Seamless • Electric Weld Spiral, Lap Butt Weld • Shore Dredge • SPEED-LAY.

PILING—Sheet piling, lightweight —Tubular—all size.

PILE FITTINGS—All types and sizes for steel and wood.

For Oil, Chemical, Concrete, Asphalt and other Industrial Requirements, ALBERT "Rings the Bell."

ALBERT
PIPE SUPPLY CO.
BERRY AT NORTH 13th STREET
BROOKLYN 11, N. Y.

Mark E. Putnam

Continued from page 283

The engineering department could help out, Dr. Dow mentioned casually.

At this point Putnam asked, "What do you want me to work on?" The answer, "An organic chemist ought to be able to figure out something to get started on." The upshot was, Putnam decided on salicylic acid, equipped his laboratory and went to work. That marked the beginning of what today is a large line of pharmaceuticals, including salicylic acid and derivatives. Through the years he has also taken an active part in the development of chlorobenzene, phenol, Dowicides, aniline and other products. During World War II he had executive charge of chemical warfare developments at Midland, and styrene production for Dow—in addition to his regular duties.

His principal leisure-time activity is reading, and he does a tremendous amount in the fields of economics, international politics, history, geography and geology. Most any evening will find him in his well stocked library looking into a subject of current interest.

As he puts it, he plays golf "for exercise, not for fun." He loves travel and has covered much of the North American continent and has made two trips to Europe.

Christian V. Holland. Deputy chief of the drugs, alcohol and solvents branch, NPA, and chief of its drug and cosmetics section. On leave as coordinator of manufacturing facilities, Sterling Drug, where he has been since 1947. With Merck for 12 years previous. Studied chemical engineering at the University of Virginia, Johns Hopkins, MIT.

Daniel S. Trifan. Head of the chemical section, plastics laboratory staff, Princeton. Formerly on the faculty at the University of California and Bowling Green State University. Studied at Baldwin Wallace College, Western Reserve, Harvard (doctorate in organic chemistry).

H. V. Churchill. Retired chief of the analytical division of Alcoa's aluminum research laboratories at New Kensington, Pa. Affiliated with the company since 1919. His successor is his son, **J. Raynor Churchill**, who has been with the company since 1929.

Wendell C. Peacock. Vice president and technical director and a member of the board of directors, Tracer-

(Continued)

The Simplest Filter Cartridge Lasts the Longest...Twice as Long

Cartridge renewals are cut at least *in half* when Cuno MICRO-KLEAN replaces any other filter. And throughout its service life, MICRO-KLEAN is *guaranteed* for specific performance.

CUNO

Fluid Conditioning

Removes More Sizes of Solids from More Kinds of Fluids

Strain fuels, lubricants, process fluids, etc.—AUTO-KLEAN
Filter fuels, lubricants, process fluids, etc.—MICRO-KLEAN
Clean raw water, recirculating water, etc.—FLO-KLEAN

Less Expensive "Felted" Filter Does Most Clarifying Jobs Better

Many chemical firms, faced with a fluid-filtering problem, turn to a Cuno MICRO-KLEAN filter for the solution.

In most cases, the MICRO-KLEAN gives perfectly satisfactory clarification and for less cost—measured in money and maintenance—than other types.

The MICRO-KLEAN cartridge is a simple, compact structure of "felted" fibres, with no internal or external supports to take up space and complicate installation. Instead of periodically *renewing* the filter, the inexpensive cartridge is thrown away and replaced—quickly and with no mess.

The MICRO-KLEAN cartridge is mechanically strong, due to resinous impregnation and polymerization. It won't swell or shrink, soften or harden, rupture or channel—or otherwise release contaminants.

MICRO-KLEAN'S greater dirt-holding capacity means fewer cartridge changes, larger batches per set of cartridges. The greater dirt capacity comes from maximum porosity (85-90%) and from its exclusive "graded density in depth", permitting smaller particles to penetrate further, rather than "loading" the surface.

Cuno MICRO-KLEAN handles a wide range of fluids with low pressure drop, and is guaranteed to remove 100% of all solids for which it is rated* plus a large percentage down to 1 micron.

*10, 25, 50 microns.
Capacities: a few to over 500 gpm.

Cuno Engineering Corporation
Dept. 103C, South Vine Street, Meriden, Conn.
Please send information on Cuno MICRO-KLEAN for following service.....
Name.....Title.....
Company.....
Address.....
City.....Zone....State....
Please attach to business letterhead

"LIQUIDS WORTH STORING ARE WORTH MEASURING"
with a
LIQUIDOMETER
Tank Gauge
• FOR GAUGING LIQUIDS OF ALL KINDS
• 100% AUTOMATIC
• APPROVED BY UNDERWRITERS' LABORATORIES

THE LIQUIDOMETER CORP.
36-29 SKILLMAN AVE., LONG ISLAND CITY 1, N.Y.

OLDBURY
ELECTRO-CHEMICAL COMPANY

•

PHOSPHORUS (Yellow or White)	PHOSPHORIC ANHYDRIDE
PHOSPHORUS OXYCHLORIDE	PHOSPHORIC ACID
PHOSPHORUS TRICHLORIDE	SODIUM CHLORATE
PHOSPHORUS PENTACHLORIDE	POTASSIUM CHLORATE
PHOSPHORUS PENTASULFIDE	POTASSIUM PERCHLORATE
PHOSPHORUS SESQUISULPHIDE	HYPOPHOSPHITES
AMORPHOUS PHOSPHORUS	OXALIC ACID (Powdered or Crystal)

ZINC PHOSPHIDE

•

Plant and Main Office:
NIAGARA FALLS, NEW YORK

New York Office:
19 RECTOR ST., NEW YORK 6, N.Y.

NAMES IN THE NEWS, cont. . .

lab, Inc., Boston. One of the company's founders in 1946. Doctorate from MIT, 1944; subsequently in charge of radiation detection program there. At Oak Ridge, worked on advanced procedures for radioisotope standardization.

C. F. Winans. From manager of the Koppers chemical division's Petrolia, Pa., plant to manager of the division's chemical development section. **C. J. Snyder, Jr.**—from acting manager to manager of the plastics development section. **C. D. Burton**—from manager of the Berkeley Heights, N. J., plant to manager of the Petrolia plant. **H. M. Hartong**—from assistant manager of the Kobuta, Pa., plant to manager of the Berkeley Heights plant.

Samuel Siegel. Associate professor of chemistry, University of Arkansas. Formerly assistant professor of chemistry at Illinois Institute of Technology.

Paul W. Blume. With the market development staff of Wyandotte Chemicals. Formerly secretary and director of development at Michigan Chemical Corp. Chemical engineering graduate of Ohio State.

J. W. Barber. Rubber service engineer, Philblack sales division, Phillips Chemical Co. Formerly superintendent of the company's Philblack plants at Borger, Tex. His successor at Borge is **A. J. Head.**

W. A. Patterson. Project engineer in charge of application problems involved in infrared spectrochemistry for Baird Associates. Formerly group leader in the central research laboratory, Canadian Industries, Ltd.

Philip R. Tarr. Assistant to the president, Monsanto. Company background: joined in 1946 as assistant to the secretary of the executive committee; technical director; assistant director of industrial preparedness.

John S. Hayes. Assistant director, general engineering department, Monsanto. Has been engineer with the company's Merrimac Division. Joined Monsanto in 1942.

Carl Wagner. Winner of the first Palladium Medal Award presented by the Electrochemical Society for outstanding contributions to corrosion and to fundamental electro-

chemistry. Known for his work on the theory of oxidation and tarnish of metals. Visiting professor of metalurgy, MIT.

Willis M. Cooper. Chief engineer, engineering department, organic chemicals division, Monsanto. Has been assistant director, general engineering department. With Monsanto since 1935.

OBITUARIES

Earl K. Fischer, 45, chief of the organic coatings section, National Bureau of Standards, died August 3. Before joining the bureau in 1949 he had been head of the physical chemistry division of the Institute of Textile Technology, Charlottesville, Va.

G. Frederic Bauer, 50, chief technologist of the National Airoil Burner Co., Philadelphia, died August 9 in Richmond, Calif.

Corydon M. Grafton, 48, chief chemical engineer of Goodall-Sanford, Inc., Reading, Mass., died at Boston hospital on August 14.

Robert Russell Stewart, 62, industrial analyst for the Bonneville Power Administration, died in Portland, Ore., August 25.

Henry Howard, 83, past president of AIChE and AES and 1951 winner of the Perkin Medal, died in Cambridge, Mass., August 26. At various times in his career he had been vice president of Merrimac Chemical Co., director of research and development of Grasselli Chemical Co.

Asa H. Nuckolls, 70, chemical engineer of Underwriters' Laboratories, Inc., from 1906 to 1946, died in Wheaton, Ill., August 31.

Francis G. Graves, 49, senior research chemist for the California Research Corp., died in Carmel, Calif., September 7. A graduate of the University of California, he had spent the 28 years since his graduation with Cal Research.

Ray A. Patelski, 45, with the chemical research department of Chas. Pfizer since 1938, died in Brooklyn, September 7.

Albert E. Marshall, 67, consulting chemist and former president of AIChE, died in Providence, R. I., September 15. From 1938 until 1948 he was president of the Rumford Chemical Works.

Check Your Needs on this . . .

CESCO

SAFETY EQUIPMENT INDEX

APRONS
☐ Acitex
☐ Plastic

GOGGLES
☐ Acid
☐ Cases
☐ Chemical
☐ Chippers
☐ Coverlite
☐ Cup-type
☐ Dust
☐ Flash
☐ "Hat-n-Gogs"
☐ Headgear-Type
☐ Painters
☐ Plastic
☐ Prescription
☐ Spec-Lite
☐ Spectacle-Type
☐ Speed-Shift
☐ Spot Welders
☐ Welders
☐ Wide Vision
☐ Wire Screen

GUARDS
☐ Grinder
☐ Toe

HELMETS
☐ Air-Fed
☐ "Hat-n-Shield"
☐ Welders

HOODS
☐ Acid
☐ Air-Fed
☐ Babbitting
☐ Dust
☐ Paint Spray

LENSES
☐ Anti-Glare
☐ Bi-Color
☐ Blue, Aluminum
☐ Blue, Mellers
☐ Cascowald
☐ Clear Cover
☐ Essentiolite
☐ Perma-Clear
☐ Pit-Proof Cover
☐ Re-Flecto-Ray
☐ Smoke-Green
☐ Super Safety

RESPIRATORS
☐ Air-Fed
☐ Dust
☐ Fume

SHIELDS
☐ Face
☐ Hand
☐ "Hat-n-Shield"
☐ Observation
☐ Spark
☐ Welders
☐ Wire Screen

SLEEVES
☐ Acitex

SPECTACLES
☐ Clip-On
☐ Comfort-Bridge
☐ Plastic
☐ Side-Shield Type
☐ Smelters
☐ Welders

See your CESCO distributor . . .
or write us for literature . . . today

CHICAGO EYE SHIELD CO.
2342 Warren Boulevard • Chicago 12, Illinois

CESCO

OFFICES IN: Atlanta, Birmingham, Boston, Buffalo, Cincinnati, Cleveland, Columbus, Detroit, East Orange, Houston, Los Angeles, Montreal, Philadelphia, Pittsburgh, Salt Lake City, Spokane, St. Louis, St. Paul, Toledo, Tulsa

FOR LOWER STORAGE COSTS

SPECIFY

Kalamazoo

GLAZED TILE

You practically eliminate maintenance problems and costs when you store bulk materials such as chemicals, coal, ashes, sand, gravel, cement, clay, grain, fertilizers, etc., in tanks and silos made of Kalamazoo Glazed Tile. Far superior to concrete—easy to clean—cannot contaminate contents. For a *permanent* low-cost installation, specify Kalamazoo Glazed Tile.

Kalamazoo TANK AND SILO COMPANY

539 HARRISON ST. KALAMAZOO, MICHIGAN

INDUSTRIAL NOTES

NEW FACILITIES

B. F. Goodrich Chemical Co.—A recently completed polyvinyl chloride plant at Avon Lake, Ohio. The plant consists of a three story process building, above right, and a warehouse.

Food Machinery & Chemical Corp.'s Niagara Chemical Division—A plant for mixing insecticides and fungicides in Yakima, Wash., to serve the Pacific Northwest. Facilities for producing weed killers and fertilizers are expected to be added later.

Shell Oil Co.—A multi-million dollar expansion at its Willbridge Terminal in northwest Portland, Ore. Petroleum processing facilities and storage capacity have been enlarged 35 percent.

Kaiser Steel Corp.—Four waste heat boilers and an electrostatic precipitator for removal of smoke for its Fontana plant. Smoke is expected to be reduced by 95 percent.

California Spray-Chemical Corp.—Insecticide compounding plant and a warehouse to be built in Milwaukee, Ore., near Portland.

International Minerals & Chemical Corp.—Sulphuric acid plant to produce 75 tons of 100 percent acid a day at Mason City, Iowa.

Marco Chemical Co.—A plastics plant in Elizabeth, N. J. which will replace its present Sewaren plant.

C. P. Hall Co., Chicago—More processing units to increase output of esters, plasticizers, emulsifiers, surface-active agents.

Raymond Corp., Greene, N. Y.—An additional plant at Morris, N. Y., to manufacture material handling equipment.

Pennsylvania Salt Mfg. Co.—A district office in Atlanta, Ga., with J. Howard Morrison as district sales manager.

Swartwout Co., Cleveland—Sales office in Houston to handle its power plant, process control and ventilating equipment.

American Meter Co., Philadelphia—Orifice meter plant in Dallas managed by Donald C. Holtz.

Forest Fibre Products Co.—Doubled capacity at its hardboard plant near Forest Grove, Ore., plant.

Monsanto Chemical Co.—Vanillin plant to be built at Seattle which eventually will include facilities for refining lignin, a pulp-mill byproduct. Final conversion of the liquid to vanillin will be made at St. Louis.

Schenley Laboratories, Lawrenceburg, Ind.—An addition to its pharmaceutical plant which will boost production of penicillin and streptomycin by 30 percent.

Bowser, Inc., Chicago—The facilities and staff of National Scientific Laboratories, Inc., Washington, D. C., of which it recently acquired ownership.

Weyerhaeuser Timber Co.—A bleach-kraft pulp mill at Everett, Wash., estimated to cost $20 million. It will have a 250-ton daily capacity when it is completed in two years time.

Hamilton Copper and Brass Works, Hamilton, Ohio—Facilities of Bucyrus Kettle Works, Bucyrus, Ohio, which it has purchased.

Aluminum Co. of America—An additional laboratory building at New Kensington, Pa.

Hagan Corp., Pittsburgh—Three sub-offices of its new Chicago district office located at Rockford, Ill., Peoria, Ill., and Indianapolis, Ind.

American Phenolic Corp., Chicago—A plant to manufacture coaxial cable and molded plastics.

St. Joe Paper Co., Port St. Joe, Fla.—An expansion which will increase daily output of Kraft paper from 400 to 1,200 tons. It will be completed next year.

Kirk & Blum Mfg. Co.—A completely modernized plant for fabricating dust-collecting and fume removal systems, at its old site in Cincinnati.

Cornell University—A laboratory devoted specifically to rubber and plastics. The unit is named for Dr. William C. Geer of Ithaca, one of the country's foremost rubber chemists.

Illinois Institute of Technology, Chicago—An instrumentation laboratory named for Erwin O. Freund, founder of the Visking Corp.

NEW LOCATIONS

De Laval Steam Turbine Co., Trenton, N. J., has moved its San Francisco office to 160 Folsom St.

Pacific Electric Mfg. Corp., formerly of San Jose, Calif., has opened its new $650,000 plant in Santa Clara.

Edward Valves, Inc., East Chicago, Ind., has moved its Pittsburgh sales office to 235 Fourth Ave.

NEW NAMES

Los Angeles Scientific Instrument Co. has changed its name to Lory Instrument Co. The company has recently moved to larger quarters at 2451 Riverside Dr., Los Angeles.

Standard Varnish Works, New York, has changed its name to Standard-Toch Chemicals, Inc.

Klingerit, Inc., New York manufacturer of valves and level gages, has changed its name to Strahman Valves, Inc.

NEW REPRESENTATIVES

Flexitallic Gasket Co., Camden, N. J., has added six new agents to its field organization. They are Jno. D. Hiles Co., Pittsburgh; Engineering Products Co., Charleston, W. Va.;

(Continued)

TOO "HOT" FOR ORDINARY HANDS!

When materials are too "hot" to handle, Greer solves the problem with "mechanical hands" remotely controlled by an operator far enough away for absolute protection.

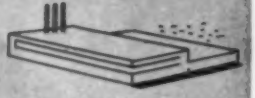
These remarkably ingenious devices rival the versatility of the human hand. Objects weighing up to 250 lbs. are moved up, down, sideways, and are pin-pointed on any working area. It is a simple matter, for instance, to pour liquids from container to container.

Many less dramatic but equally important materials-handling and similar problems have been solved – or are being solved – by Greer Research and Development engineers. With many years of work in the field, these men offer you specialized knowledge and abilities which are difficult to find elsewhere.

If you are concerned with any phase of materials handling, you are invited to bring your problems to Greer. Here you will find *creative engineering* at its best – the kind that is accustomed to meeting and solving the "impossible". An inquiry on your company letterhead will receive prompt attention.

GREER HYDRAULICS INC. • 454 EIGHTEENTH STREET • BROOKLYN 15, NEW YORK

for INDUSTRY
for FOOD
for FINE CHEMICALS
the same
High Purity Standard



Red Diamond
CARBON DIOXIDE

Red Diamond CO_2 is manufactured to the high standards of purity required by the medical and food industries which "Liquid" also serves. It is your assurance of dependable purity so essential in many research and production applications.

CO_2

Write for a free copy of "A CHART OF INDUSTRIAL USES" which suggests many of the almost unlimited ways to use valuable CO_2 in industry. Complete technical service available.

in all its forms —GAS • LIQUID • SOLID

BY Liquid

WORLD'S LARGEST PRODUCER OF CO_2

A National Network of Service
—28 Producing Plants—Over 70
Distributing Points in U. S. A.

The LIQUID Carbonic
CORPORATION
3100 South Kedzie Avenue • Chicago 23, Illinois

INDUSTRIAL NOTES, cont. . .

Chapman Engineering Sales Co., Cincinnati; De Haven Engineering Co., Indianapolis; Steel & Engineering Products Co., El Paso; Energy Control Corp., Philadelphia.

Kessler Chemical Co., Philadelphia, has appointed Daniel G. Hereley Co., Chicago, as sales agent for the Chicago area; Truesdale Co., Boston, for the New England area; Plastex Products Co., Marietta, Ga., for the Southern area.

Patent Chemicals, Inc., Patterson, N. J., producer of oil soluble colors used to tint gasoline by the petroleum, has appointed Nelson A. Howard, Jr., its representative in the Los Angeles area.

Day Co., engineers, manufacturers and installers of dust control equipment, has appointed R. Dykstra & Co., Detroit, its representatives in the Michigan area.

NEW LINES

American-Marietta Co., Chicago—Automotive refinishing materials through the acquisition of the Arco Co., Cleveland.

Archer-Daniels-Midland Co., Minneapolis—Dehydrated alfalfa meal through the purchase of the W. J. Small Co.

Carpenter Steel Co., Reading, Pa.—Needle wire, stainless steel spring wire and other specialties in small diameters through the purchase of Webb Wire Works, New Brunswick, N. J.

Clopay Corp., Cincinnati—A rigid, corrosion resistant plastic piping. Clopay is the first firm in this country to extrude this plastic, known as Tuffstuff, into pipe and tubing.

St. Paul & Tacoma Lumber Co.—Wood pulp as a result of a $100,000 addition to its Tacoma, Wash., saw mill.

NEW COMPANIES

Wheelco Instruments of Canada, Ltd., Toronto, to handle the Canadian operations of Wheelco Instruments of Chicago, manufacturers of industrial controllers, recorders, indicators.

Graphite Specialties Corp., Niagara Falls, N. Y., to supply the chemical industry with all sizes of graphite tubes. President of the new firm is Myron Cory. —End

NOW *Quimby Pumps* WITH WARREN SERVICE

Now you can look to Warren for Screw and Rotary pumps as well as Centrifugal and Reciprocating types.

Quimby built the first balanced quadruplicate screw pump in 1893. The salient design feature of separate screws and timed driving gears have never been changed. However, refinements through the years have widened the scope of applications to include the handling of any non-abrasive liquid or semi-liquid at moderate and high pressures.

The "Rotex" is a superior rotary pump of unique construction that has numerous applications where moderate pressures are involved.

We are glad to add these new members to the Warren family and invite your inquiries on any problem involving Screw and Rotary, Centrifugal or Reciprocating Pumps.

Both Screw and Rotex type pumps are available either horizontal or vertical mounted.

GQ-1

WARREN PUMPS

WARREN STEAM PUMP COMPANY, INC., WARREN, MASSACHUSETTS

how to prevent the wrong reaction . . . .

. . . the Versenes*

VERSENE* — THE OUNCE OF PREVENTION

The wrong reaction in chemical processes always spells trouble with a capital "T." This kind of trouble is always expensive. It creates confusion, costs money, wastes time, spoils goods, reduces yields, loses business and wipes out good will. The intelligent use of one or more of the Versenes can *prevent* wrong reactions caused by certain things such as metallic impurities or contaminants in commercial grade chemicals and equipment.

HOW THE VERSENES* WORK

The Versenes are the tetra sodium salts of ethylene diamine tetra acetic acid and other polyamino acids. They are among the most versatile and powerful chelating (complexing) agents known. They complex any di- or tri-valent metallic ions efficiently and economically and are completely stable in hot alkaline and acid solutions. The Versenes react with most metallic ions to form soluble non-ionic metal chelate compounds. These powerful, complex compounds inactivate the metallic ions so completely that they cannot be precipitated by common precipitating agents. 500 grams of dry, or 1500 grams of liquid Versene will complex one mole of metallic ions.

VERSENES* ARE AVAILABLE

There are now 7 Versenes. Each has special applications but all help give the *right* reaction every time — despite metallic contaminations. A clue to your problem places a generation of experience in pioneering the polyamines at your disposal. Send for Technical Bulletin #2. Samples on request. Write Dept. B.

NEW VERSENE WATER TEST KIT. Tells total hardness in 2 minutes. Accurate to one grain per gallon. Versenate Method. Complete Kit $5.00 postpaid.

*Trade Mark

BERSWORTH CHEMICAL COMPANY

FRAMINGHAM, MASSACHUSETTS

Warehouse Stocks

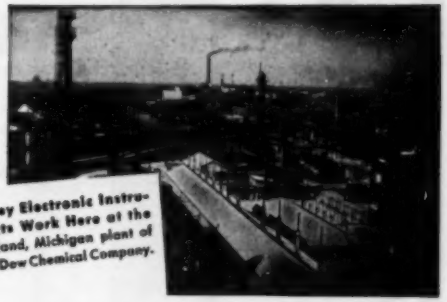
Providence Agent: George Mann, 251 Fox Point Boulevard, Providence, Rhode Island
Midwest Agent: Kraft Chemical Co., Inc., 917 W. 18th St., Chicago
Wasatch Chemical Co., Salt Lake City, Utah
W. Coast Agent: Griffin Chemical Co., San Francisco, Los Angeles
Barada & Page, Inc., Dallas and Houston, Texas
Associated Chemical Co. of Canada, 14 Durrell Ave., Toronto, Ontario

Bailey Electronic Instruments Work Here at the Lake Charles, La. plant of the Mathieson Chemical Corp.

Bailey Electronic Instruments Work Here at the Kodak Park plant of Eastman Kodak Co., Rochester, N.Y.

alkali OR FILMS

Bailey Electronic Instruments Work Here at the Chillicothe, Ohio Mill of the Mead Corporation.



Bailey Electronic Instruments Work Here at the Midland, Michigan plant of The Dow Chemical Company.

paper OR CHEMICALS

★ No matter what you process it will pay you to check into the Bailey simplified electronic control system.

With four basic circuits and eight basic component parts you can get more than 100,000 different electronic instrument and control combinations. Your problems of measuring and controlling flow, level, speed, pressure temperature, gas analysis, pH, conductivity, etc., can be solved by the right combinations of these 4 circuits and 8 basic parts.

You don't have to load up a stock room with parts. Bailey parts are interchangeable. What you used for the last combination is good for the next one when conditions in your plant change. You can save money, as others are doing, when you standardize on Bailey controls.

Bulletin No. 17 will show you how easy it is to install and use Bailey electronic controls. Write for your copy today.

●

you'll find Bailey Controls on the job

P-30

BAILEY METER CO.

1054 IVANHOE RD. • CLEVELAND 10, OHIO

Bailey Meter Company Limited, Montreal, Canada

Controls for the Process Industries

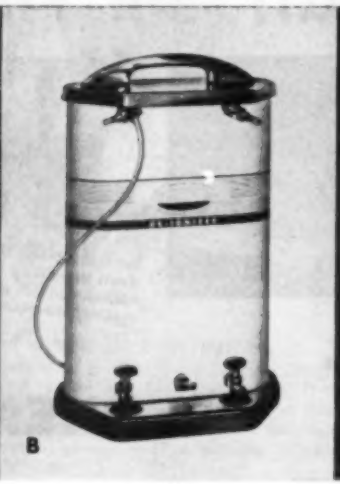
TEMPERATURE • FLOW • PRESSURE

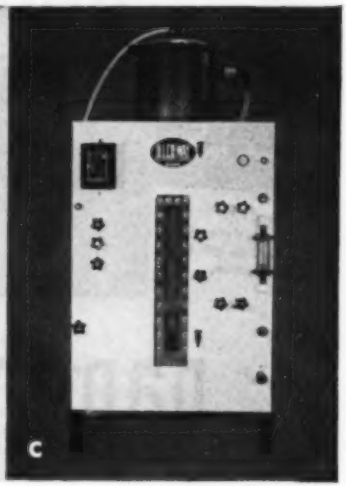
GAS ANALYSIS • LEVEL • RATIO

ILLCO-WAY offers a complete line of

"Packaged" DE-IONIZERS

Requirements for pure water in many plants are served by these famous "packaged" units, which are shipped completely assembled and mounted on a welded-steel base. They require only connection to raw water, drain and treated-water outlets. Typical ILLCO-WAY De-ionizers are models shown below.





A Industrial De-ionizer, one of a series providing solids-free water comparable to single-distilled water. Flow rates up to 1,000 gph. Shipped completely assembled with full accessories for operation, including purity indicator. Units can be furnished with materials for silica and CO_2 removal. Floor space: approximately 5' x 3'. Height: approximately 7 ft.

B Popular Portable De-ionizer provides solids-free water comparable to single-distilled water. Flow rates up to 20 gph. Capacity: 200 gallons on water containing 10 grains of dissolved solids. This versatile model can be furnished with materials for silica and CO_2 removal. Like the other ILLCO-WAY units shown, this portable De-ionizer is designed to be "regenerated" when the treated water becomes impure, thus avoiding the expense of throw-away cartridges.

C Industrial Mixed-Bed De-ionizer* provides treated water, with specific resistances up to 15,000,000 ohms. Shipped completely assembled, ready for operation, with full accessories including purity indicator. Flow rates up to 1000 gph. Floor space: 25" x 40" (max.). Height: approximately 7 ft.

D Portable Mixed-Bed De-ionizer* provides treated water with specific resistances up to 15,000,000 ohms. These units, with flow rates up to 30 gph, are specifically designed for use in laboratories or wherever small quantities of high purity water are required.

E Industrial installation (300 gpm). Such units are individually designed to provide any flow, any volume.

* Patent pending

See data in Sweet's File, Engineering

ILLCO-WAY

DE-IONIZING
DE-ALKALIZING
SOFTENING

ILLINOIS WATER TREATMENT CO., 844-9 Cedar St., Rockford, Illinois • 141 East 44th Street, New York City

Canadian Distributor: Pumps & Softeners Ltd., London, Ontario

Latest Filtration Theory and Practice

Theoretical

Shelby Miller

In the past decade, the value of using small, precise equipment to obtain fundamental filtration data and to supply necessary design information has been emphasized. Sperry[1] and Hoffing and Lockhart[2] described laboratory pressure filters that require relatively small amounts of slurry and that are capable of much greater precision than the usual semi-works filter.

Most significant recent data have been those of Ruth[3] and of Hoffing and Lockhart. These support the application of permeability observations to filtration.

Ruth reported that mechanical stress imposed upon a preformed filter cake will indicate accurately the compressive effect of friction drag experienced by the cake during its formation.

One of the most valuable applications of the filtration equations is their use to predict quantitatively the effect of a change in process conditions on a filtration cycle. Mondria[4] and Reeves[5] have so applied the constant-pressure equation to the analysis of continuous vacuum filters.

Mondria wrote the equation in a form that permits easier prediction of the effects of drum speed and of cloth blinding on filtration rate. The effects are relative to some original condition and rate and can be determined without the necessity of evaluating cake resistance. Reeves simplified the rate equation by assuming negligible filter-medium resistance and used it to formulate expressions for optimum drum speed, optimum dilution of a prefilt of relatively high filtrate viscosity, and maximum amount of wash liquor that can be applied to the cake under various conditions of solvent dilution.

Hill and Kaiser[6] stated that the effect of a change in slurry temperature on vacuum filtration rate can be estimated from the filtration equation. The data which they report, however, show a considerably greater effect than can be accounted for by viscosity change alone. This illustrates the danger of over-simplifying an implicit process variable.

The evaluation of constant-rate filtration data is extremely unpleasant because the simultaneous calculation of the four necessary constants is so laborious. A recent paper[7] presents a simplified approximation of the integrated constant-rate equation:

$$\Delta P_c = \alpha_o \ (\Delta P_o)^b \ (\mu c/p) \ (W/A\theta)^s$$

where: b = compressibility coefficient, constant for a given slurry; c = slurry concentration; α_o = cake resistance coefficient, constant for a given slurry.

The paper suggests that the pressure at the base of the cake is greater than the pressure drop across the septum at the start of filtration and may be estimated by trial and error. This equation, however, has not been sufficiently validated by experiment to warrant its general use.

(*Continued next page*)

Shelby Miller, University of Kansas, presented the paper (abstracted above) on the theoretical aspects of filtration; Charles Fuhrmeister, Jr., Oliver United Filters, Inc., discussed the practical aspects. Both papers were delivered before the American Institute of Chemical Engineers, Newark, N. J., May 8, 1951. The complete text of these papers will be published by the Institute.

Practical

Charles Fuhrmeister, Jr.

Filtration, as discussed here, is the separation of solids from liquids by mechanical means. Since the volume of liquid to be handled must pass through the filter, it is advisable to take steps to cause the highest rate of flow, and to reduce the volume to be handled to the minimum.

This paper will present some physical and chemical conditions which affect filtration rates, and some mechanical means of handling slurries which improve results.

The facts and information presented are on a practical basis, having been assembled from notes concerning field experiences. They show the usual quantitative and qualitative influence on filtration in general and indicate the following:

1. Usually, increasing the temperature of a given slurry reduces its viscosity and decreasing slurry viscosities mean increasing rates of filtration.

In observations recorded for filtering an aqueous slurry of 25 percent by weight of calcium carbonate:

It was found that filtration rate was almost constantly increased with temperature rise. The rate increased 100 percent with a 90 deg. F. rise in temperature (60 deg. F. to 150 deg. F.) or slightly better than 1 percent per deg. F.

The filter cake rate also increased constantly. (Approximately 100 percent per 100 deg. of temperature.) From slightly more than 25 lb./ft.²/hr. at 75 deg. F. to 50 lb. at 165 deg.

The effect of temperature change on the rates of filtration was similar for liquids of higher specific gravities. This was verified with observations with a slurry of 25 percent solids calcium carbonate (by weight) suspended in a 50 deg. Brix sugar solution.

2. Increased solids concentration brings about a rapid increase in the tonnage rate of filtration. Working with different concentrations of suspended calcium carbonate slurries it was found that trebling the solids concentration approximately doubled the tonnage rate.

Thus, when possible, it is advisable to thicken, within limits, slurries to be filtered to reduce the size of the filter equipment required.

3. Decreased particle size means large increase in filtration rates and efficiencies.

Data were collected from the filtration of bituminous coal fines as found in coal washeries.

When the -200 mesh content of the slurry was increased 25 percent, the tonnage rate was decreased by 30 percent and the moisture content of the filter cake increased 38 percent.

Similar results may be expected when filtering other materials but the variation in rate need not be the same as the above example.

4. In some cases, pH conditioning of sewage sludge can increase rates of filtration.

Varying percentages of ferric chloride were added to an elutriated, digested sewage sludge prior to filtration. At first the addition of a given amount of the conditioning agent caused a 100 percent increase in the tonnage rate, but continued addition of the same amount did not cause

(*Continued next page*)

FILTRATION THEORY

Burrak and Storrow[9] have embarked on an intriguing study of the analogy between centrifugal and conventional filtration. They found that the permeability of cakes of the same material formed respectively in a filter and in a centrifuge differ widely and that the fact of centrifugal stress does not seem to account entirely for the difference. These equations are worth considerable thought; it appears that they may not be completely general. Further results from this investigation promise to be rewarding.

REFERENCES

1. Sperry, D. R., *Ind. Eng. Chem.*, **36**, 323-9 (1944).
2. Hoffing, E. H., and Lockhart, F. J., *Chem. Eng. Progress*, **97**, 3-10 (1951).
3. Ruth, B. F., *Ind. Eng. Chem.*, **38**, 564-71, (1946).
4. Mondria, H., *Applied Sci. Research*, **A2**, 165-82, (1950).
5. Reeves, E. J., *Ind. Eng. Chem.*, **39**, 203-6 (1947); *Petroleum Processing*, **4**, 885-6 (1949); *Petroleum Refiner*, **26**, 552-3 (1947).
6. Hill, R. N., and Kaiser, M. M., Preprints of White Sulfur Springs meeting, pp. 57-77, American Institute of Chemical Engineers, Mar. 11, 1951.
7. Hughes, O. D., VerHoeve, R. W., and Luke, C. D., paper presented at Columbus meeting, American Institute of Chemical Engineers, Dec. 3-6, 1950.
8. Lapple, C. E., *Chem. Eng. Progress*, **43**, 544-8 (1947).
9. Burak, N., and Storrow, J. A., *J. Soc. Chem. Ind.* (London), **69T**, 8-13, (1950).

FILTRATION PRACTICE

the same increase, and overtreatment was soon reached.

Lime is employed as the conditioning agent with digested and raw sludge.

It is also frequently employed for neutralization and conditioning of plant wastes.

5. Slurries with slimy materials are best treated with a desliming machine such as a simple cone bottom desliming cyclone type separator.

Any slimy material, such as an apatite present in magnetic iron ores, will quickly blind a filter medium.

6. The use of a filter aid eductor is often indicated for introducing the aid into the slurry stream or for use when applying a precoat to a filter. Most filter aids degrade quickly when handled in slurry form by a centrifugal pump. As a result, the filter cake formed is more dense and the rate of filtration is lower.

The use of an eductor of this type has in many cases improved filtration rates as well as reduced maintenance of the filter feed equipment.

The ratio of filter aid to solids present varies with the conditions but seldom is higher than one-to-one by weight.

What's Ahead for Fluorochemicals

Plenty says this authority: Foams, high temperature lubricants, higher vinyl perfluoro esters, perfluoro aldehydes, fluorinated fire extinguishers, instruments.

James O. Hendricks

Elecrochemical fluorination, discovered by Dr. J. H. Simons of Pennsylvania State College and now being commercialized by the Minnesota Mining and Manufacturing Co., has widened the industrial-economic spectrum of fluorine.

A series of perfluoro organic acids, starting with perfluoroacetic acid, have been made in the electrochemical cell. Applications for these acids are developing.

The Atomic Energy Commission has published papers on the separation and purification of certain rare metals by means of thenoyl trifluoroacetone (TTA). Hafnium can be separated from zirconium rather effectively. In the preparation of the radioisotype carbon-45, the impurity, scandium, is removed by using TTA. These processes are of interest to the AEC. Trifluoroactetic acid can be used as one of the starting materials for the preparation of TTA.

The higher perfluoro acids, for example, perfluorocaprilic, and their salts lower the surface tension of water solutions to a very unusual degree. As a matter of fact, no known soaps or surface active agents will reduce surface tension of water as much. One industry which may use these stable surface tension lowering materials is electroplating. Logical uses could be in foams. Recently issued patents indicate that the salts of the higher perfluoro acids act as dispersing agents in the polymerization of Teflon.

Highly fluorinated materials are characterized by high specific gravity, low refractive index and non-flammability. An example of a high boiling liquid of this type is the pentaerythritol ester of perfluorobutyric acid. In many ways it resembles the liquid fluorocarbons, but its viscosity changes less with changing temperature. Examples of other highly fluorinated liquids are triperfluorobutyl amine and diperfluorohexyl ether. The basic character of these compounds has entirely disappeared and they resemble the perfluorocarbons in this respect. The compounds are remarkably stable and can be heated to 500 deg. C. in the absence or presence of air.

The dielectric constant of each is very low, less than 2. These liquids have interesting possibilities in precision instruments where their noncorrosiveness, high density and heat stability are important. Their low dielectric constant may make them suitable for use as liquid coolants in electrical equipment where very high frequency pulses are encountered.

Liquid polymers of trifluorochloro ethylene (Kel-F monomer) are finding specialized uses as lubricants because of their high temperature stability and lubricity. The newer perfluoro liquids, mentioned above, may also find application for this purpose. They remain liquid over a wide range of temperature.

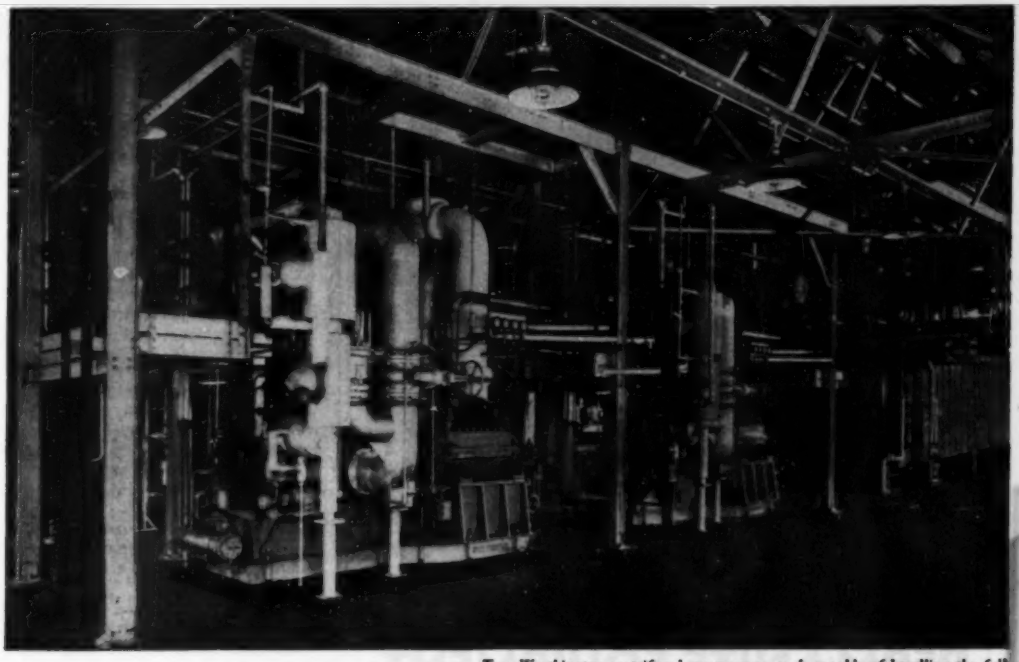
Vinyl perfluoresters have been prepared by reacting acetylene with a number of the perfluoro acids, starting with the C_2 acid and going as high as C_{10}. The monomers polymerize to yield transparent, colorless, thermoplastic resins.

Polyvinyl perfluoroacetate has been made before, but the higher vinyl esters and polymers are new. These polymers are still in the experimental stage. They are soluble in a number of fluorinated solvents.

A whole host of derivatives have been made from the perfluoro acids. Some require new syntheses and others were prepared according to methods already worked out in the hydrogen series. Especial attention is called to the perfluoro aldehydes, an entirely new class of perfluoro compounds. These were announced two years ago. They form polymers which have shown resistance to hot, concentrated nitric acid. These materials, however, are still in the laboratory stage of development.

A special derivative of trifluoroacetic acid is trifluoromethyl bromide. It has exceptional efficiency as a flame extinguisher. This chemical has the advantage of forming relatively non-

(Continued)



Two Worthington centrifugal compressors, each capable of handling the full 380-ton load; at right, one of the three Worthington chilling machines.

How Socony-Vacuum Gives Wax the Cold Shoulder

For the new addition to its Paulsboro refinery, Socony-Vacuum and its process engineers and constructors, E. B. Badger & Sons Co., found the *right* chilling equipment in Worthington's complete line.

Here's how this modern plant meets the 380-ton refrigeration load required by its solvent dewaxing process.

Plant propane is alternately condensed and vaporized in a closed cycle. The liquid propane, boiling at a low pressure and a constant temperature of minus 25F, surrounds the tubes in the Worthington inclined chiller through which the wax-bearing mixture is pumped.

Propane vapor, released in the chiller, is withdrawn to be compressed, with two liquid intercooling stages, from suction conditions of about 8 psig to a condenser pressure of 215 psig.

The compressors are four-stage Worthington centrifugal compressors. They are driven by 8420 rpm Worthington steam turbines which take steam from the plant mains at about 400 psig and exhaust at 40 psig back pressure to be used for heating purposes in other parts of the solvent recovery process.

Important installations such as this one are most likely to include Worthington refrigeration, because Worthington offers complete cycles for petroleum, chemical and petro-chemical applications, including centrifugal charge gas compressors for high pressure, condensers, coolers and exchangers.

Take advantage of the *more worth in Worthington*. Write for bulletin to Worthington Pump and Machinery Corporation, Air Conditioning and Refrigeration Division, Harrison, New Jersey.

A1.43

WORTHINGTON

THE ONLY COMPLETE LINE...ALWAYS THE CORRECT RECOMMENDATION

Strong, Light Weight, Corrosion Proof

PERMANITE EQUIPMENT

The Permanite constructed 1200 gallon tank above combines exceptional strength and light weight (1000 lbs.) with ease of installation and maintenance. It is totally inert to most corrosives including hot Muriatic acid to 230°F, HF, all alkalies, non-oxidizing acids and oils. Permanite can also handle organic solvent vapors to 300°F.

Permanite is a furan resin material reinforced with woven chemical glass fiber. It is strong, tough and highly corrosion resistant and is used:

As a corrosion proof lining for steel, brick or concrete vessels.

As a structural material for complete functional units such as fume washers, HCl absorbers, towers and heat exchangers.

In molded one-piece units as sinks, trays, tanks.

As a physical and thermal shock resistant armor for Knight-Ware Ceramic pipe, kettles, heat exchangers.

As light-weight pipe and fume ducts in diameters from 1¼" to 36".

Permanite pipe is easily machined, sawed and drilled. It may be installed with a minimum of support and is easily cut apart and joined in the field.

It will pay you to get all the facts on Permanite. Write for Bulletins No. 68 Permanite Equipment, No. 18 Permanite Pipe and Ductwork, No. 78 Permanite HCl Absorbers.

Maurice A. Knight 110 Kelly Ave., Akron 6, Ohio

Acid and Alkali-proof Chemical Equipment

QED, cont. . .

toxic byproducts after a flame has been put out. Most other extinguishers form toxic products.

James O. Hendricks, Minnesota Mining and Manufacturing Co., before the American Chemical Society, New York, Sept. 4, 1951.

SYNTHETIC FUELS

. . . *From Natural Gas*

P. C. Keith and J. W. Arnold

Thousands of barrels of gasoline and millions of gallons of ethyl alcohol could be created every year from 2 trillion feet of natural gas without jeopardizing present and future needs for utility and other fuel purposes.

Acetylene and the rare gases krypton and xenon could also be prepared from natural gas.

The synthetic fuels industry could be based on a Fischer-tropsch synthesis. Shale or coal could also be used.

Hydrocarbon Research Corp., making research and full-scale development studies for such an industry, came to some interesting conclusions.

Of particular interest was the discovery that the environment of the catalyst, that is, the composition of the gas flowing through the catalyst chamber, is equally as important as the catalyst preparation, both in achieving the desired product and in preserving the activity and selectivity of the catalyst.

A synthetic fuels industry based upon one-fourth the estimated available gas, or an annual consumption of 500 billion cubic feet, could supply 90,000 bbl. of gasoline or 5 percent of the present demand.

In addition, such a synthetic fuels industry would produce ethyl alcohol almost equal to the entire United States production in 1948 (130 million gallons). Millions of gallons of higher alcohols, aldehydes, ketones and fatty acids not now available, or available in limited amounts, would also be produced annually.

Other chemicals and special products for which there is a growing demand would be available in large quantities as byproducts of the synthesis process or could be available by simple, commercially proved operations. Probably most important of these are the straight chain olefins and acetylene. Ethylene, propylene, and higher molecular weight olefins would be available as byproducts and acetylene could be readily produced by a modification of the combustion process. The quantities of these chemi-

cals potentially available would give a tremendous impetus to the already expanding synthetic chemicals industry.

Tremendous quantities of oxygen would be separated from air and this operation would make feasible the recovery of krypton and xenon.

Collateral engineering and manufacturing benefits of the development of such a synthetic fuels industry from natural gas would be: (1) the production of tonnage oxygen; (2) the efficient production of mixtures of carbon monoxide and hydrogen for the synthesis of ammonia, methanol and other chemicals; (3) many new applications of unit operations such as the simultaneous removal of large quantities of heat and the control of temperature of reacting vapors; the handling of gases and liquids under pressure and at temperatures as low as −300 deg. and the handling of gases under pressure at temperatures up to 2,600-2,800 deg. F.

P. C. Keith and J. H. Arnold, Hydrocarbon Research Inc., before the American Chem. Society, New York, Sept. 6, 1951.

RADIOACTIVE CELLULOSE

. . . *Attrition Studies*

Francis W. Monor, et al

Radioactive cellulose, with the radioactive atoms placed in known positions, has been produced for the first time. The radioactive material is produced by the action of certain bacteria fed on radioactive sugars.

The "tagged" cellulose now can be used to study the exact effects of age, sunlight, weathering, wear, fungi and other types of attrition on all important cellulose products of every day life.

Exactly how cellulose breaks down in actual usage has been a challenging problem. It is not now known, for example, exactly what becomes of the cellulose molecule when wood rots or when a cotton awning is exposed to the sunlight until it crumbles.

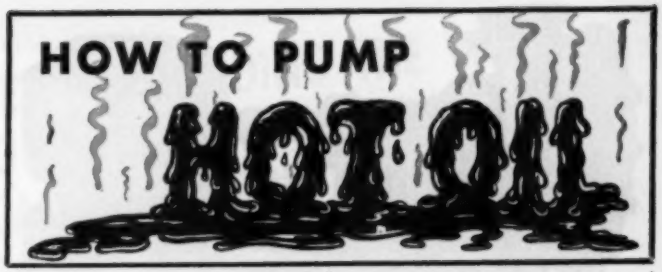
The exact chemical reactions which take place when paper becomes yellow and brittle with age or when a lacquer film peels or becomes chalky are similarly not well understood. The manner in which mildew attacks rayon and other vegetable fibers is

(*Continued*)

MOXIE FOR THE BIG CATS

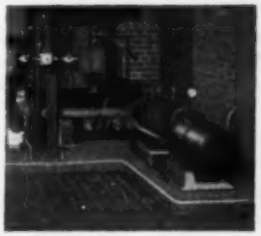
"Modern catalytic crackers contain up to 700 tons of catalyst. The ground particles of catalyst are so fine a fistful looks like chalk dust, and catalyst dust whirls through the pipes of the units at a rate of up to 35 tons a minute."

Texaco Star



Pumping hot oil for industrial processes or in refinery applications is a specialty of KINNEY HELIQUAD HQ ROTARY PUMPS. Efficiency and durability — all important in this type of work — are the big recommendations for Kinney HQ Pumps. One Kinney HQ 8 x 4 Pump has been in hot oil service for over 12 years, delivering 190 g.p.m. and supplying 1,600,000 B.T.U. per hour . . . and it's still performing at full rated capacity! This is a typical case history for Kinney Pumps.

For most hot oil pumping jobs, we recommend cast steel HQ Pumps due to the shock temperature conditions encountered. We offer a wide range of jacketed pumps, several sizes of which are listed in the table. Besides the operating temperature, our engineers will need to know the gravity and viscosity of the oil in order to recommend the right pump for your particular job. Be sure to specify whether the service is continuous or intermittent, and also what the suction and discharge pressures will be.



General Aniline Works Division of General Aniline & Film Corporation at Rensselaer, N. Y., employs this circulating oil heating system to process dye intermediates. The system depends on a Kinney Heliquad Pump to deliver oil at temperatures up to 300°F and pressures up to 100 psi to an oil-jacketed kettle. The complete installation is explosion-proof for safe handling of flammable solvents.

PUMP SIZE	HQA 6373	HQA 64573	HQA 8493
Pumping Temp. °F.	600	600	600
Absolute Viscosity in Poises	.005	.005	.005
Capacity GPM	90	140	180
Speed RPM	320	320	420
Differential Pressure	50	50	50

Other sizes are available.

Whatever your hot oil pumping problem, it will pay you to consult Kinney. Send coupon for new Liquid Pump Bulletin, KINNEY MANUFACTURING COMPANY, Boston 30, Mass. Representatives in New York, Chicago, Cleveland, Houston, New Orleans, Philadelphia, Los Angeles, San Francisco, Seattle, and foreign countries.

Kinney LIQUID PUMPS

KINNEY MFG. COMPANY
3551 WASHINGTON ST., BOSTON 30, MASS.
Gentlemen: Please send me new Bulletin L51.
My liquid pumping problem involves:

☐ Alcohol ☐ Asphalt ☐ Caustic ☐ Crude Oil
☐ Lube, Diesel Oil, etc. ☐ Distillate ☐ Edible Oils ☐ Fuel Oils
☐ Road Oil ☐ Molasses ☐ Hot Oil ☐ Gasoline
☐ Solvents ☐ Water ☐ Others (see letter attached)

Name _____ Company _____

Address _____

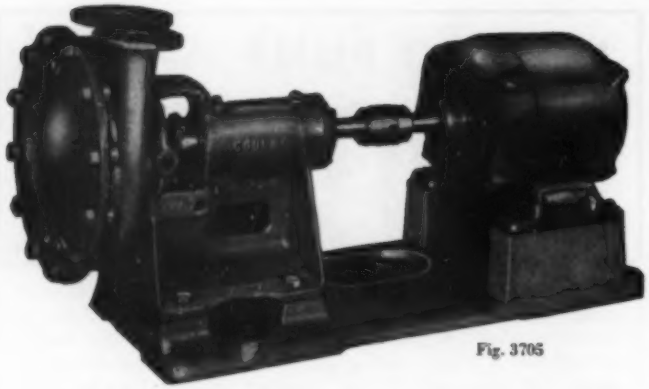


Fig. 3705

For Outstanding Service Handling Corrosive Liquids—

Goulds new stainless steel centrifugals

ADVANCED PUMP DESIGN—

The Goulds 3705 stainless line represents the last word in effective design. Fig. 3705 pumps will give you efficient, dependable, 24-hour service in handling corrosive liquids—at low cost.

CAPACITIES—

Goulds stainless steel centrifugals are made in 9 sizes with capacities to 750 G.P.M. and heads to 180 ft. depending upon capacity.

ADVANTAGES—

Exceptional efficiency (see Bulletin for performance curves) plus extreme simplicity make this an ideal pump for corrosive applications. High interchangeability of parts cuts stocking problem. Quick inspection or cleaning—simply remove casing cover without disturbing pipe connections.

Write for Bulletin 725.3 for complete details on this new stainless steel pump.

MEMBER

Goulds PUMPS INC. Seneca Falls New York

QED, cont.

another example of the important economic problem of cellulose degradation.

A second major problem is the mechanism by which the living plant manufactures cellulose. The chemical structure of cellulose is reasonably well worked out, but it has never been prepared by a purely synthetic method.

It is built up in nature by almost all higher forms of plant life as well as by certain bacteria of the well known group responsible for the formation of vinegar. These bacteria (*Acetobacter xylinum*) have now been used to produce a new type of radioactive cellulose and it is expected that this material will contribute greatly toward the ultimate solutions of these problems.

Francis W. Monor, Anthony M. Schwartz, Glenn A. Greathouse and Milton Harris, Harris Research Laboratories, before the International Congress of Pure and Applied Chemistry, New York, Sept. 12, 1951.

EDUCATION

. . . *Industry and Colleges*

W. T. Nichols

A survey was made to find out how industry and colleges can cooperate to improve chemical engineering education.

More than 400 industrialists and college instructors were contacted, queried on 11 classifications of suggestion.

Responses indicated that great improvements in technical education can be accomplished by increasing summer jobs for teachers, by increasing the number of graduate fellowships, by providing more summer jobs for students. In addition, it was indicated that more use of teachers as consultants, providing one year positions in industry for teachers, and more speakers for student gatherings would aid in the education of our students.

W. T. Nichols, Monsanto Chemical Co., before the American Institute of Chemical Engineers, Rochester, Sept. 19, 1951.

CHEMICALS IN FOODS

. . . *Faster Testing*

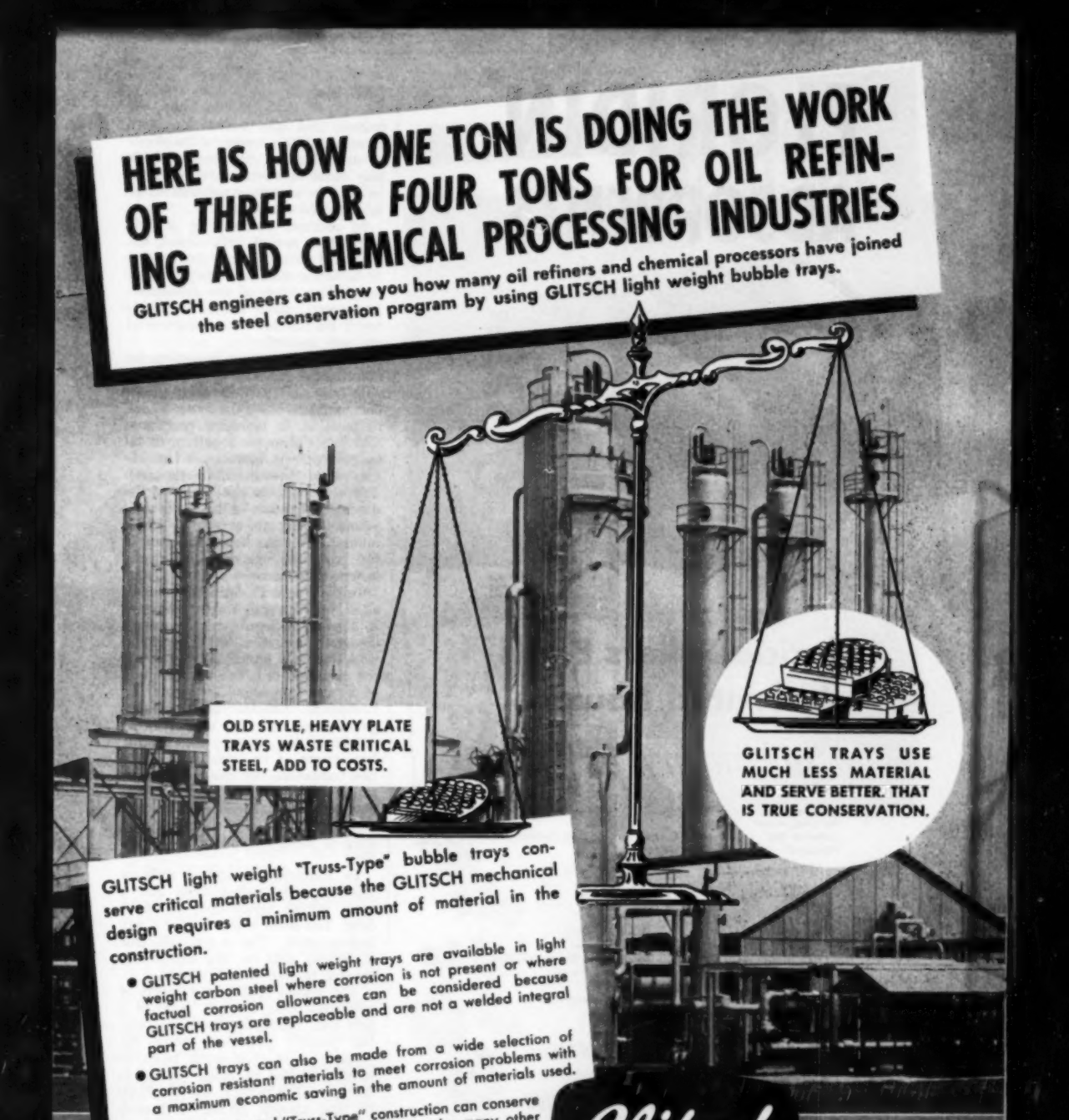
L. C. Cartwright, et al

Short-cut methods of testing new chemicals, prior to human use, are now possible. The new idea saves time and expense, spares laboratory

(Continued)

HERE IS HOW ONE TON IS DOING THE WORK OF THREE OR FOUR TONS FOR OIL REFINING AND CHEMICAL PROCESSING INDUSTRIES

GLITSCH engineers can show you how many oil refiners and chemical processors have joined the steel conservation program by using GLITSCH light weight bubble trays.



OLD STYLE, HEAVY PLATE TRAYS WASTE CRITICAL STEEL, ADD TO COSTS.

GLITSCH TRAYS USE MUCH LESS MATERIAL AND SERVE BETTER. THAT IS TRUE CONSERVATION.

GLITSCH light weight "Truss-Type" bubble trays conserve critical materials because the GLITSCH mechanical design requires a minimum amount of material in the construction.

- GLITSCH patented light weight trays are available in light weight carbon steel where corrosion is not present or where factual corrosion allowances can be considered because GLITSCH trays are replaceable and are not a welded integral part of the vessel.
- GLITSCH trays can also be made from a wide selection of corrosion resistant materials to meet corrosion problems with a maximum economic saving in the amount of materials used.
- GLITSCH patented "Truss-Type" construction can conserve critical materials in addition to offering the many other advantages of; flexibility of design, simplified installation, ease of cleaning, saving of costly downtime, minimum of maintenance, small replacement inventories, and indefinite tray life.

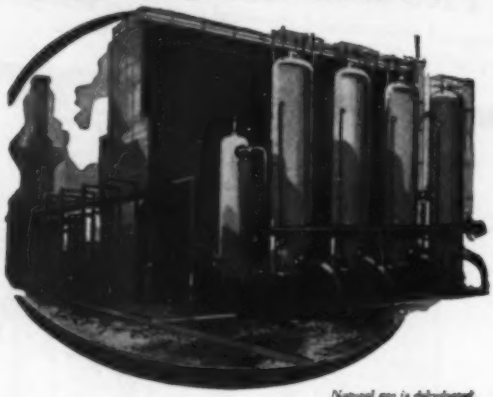
Glitsch

FRITZ W. GLITSCH & SONS., INC.
P. O. Box 6227
Dallas 2, Texas

NEW YORK, CHICAGO, HOUSTON, CLEVELAND, TULSA, LOS ANGELES, TORONTO

"TRUSS-TYPE" BUBBLE TRAYS • BUBBLE CAPS • TOWER AND TOWER INTERNALS

FLORIDIN ADSORBENTS



Natural gas is dehydrated by use of a Floridin product in this modern plant of an important company operating in the Southwest.

Florida Fullers Earth Activated Bauxite

act many parts

Adsorbent	Filter Aid	Drying Agent
Bleaching Agent	Catalyst	Filler
Colloidal Gel	Catalyst Carrier	Suspension Builder
Flocculant	Catalyst Binder	

in many uses

Oil Refining
Desulfurization
Dehydrogenation
Solvent Reclamation
Pipe Line Drying
Polymerization
Treatment of Waste
Selective Catalysis
Water Treatment
Formulation of Insecticides and Fungicides

Ask for Floridin bulletins.....
File them for ready reference

FLORIDIN COMPANY
Adsorbents .. Desiccants ... Diluents

DEPARTMENT A, 220 LIBERTY ST. WARREN, PA

QED, cont. . .

animals and also makes for more accurate results in trying out the effects of new chemical compounds which may come in contact with food, or be used in new drug preparations or in improved cosmetics.

In addition to revealing possible toxic effects in trials with animals, the shortened procedures can also be used to minimize work in testing the bacteria-killing power of new antiseptics. If necesary, plants could be quickly tested for edibility by an adaption of the new method.

The investigators set themselves the objective of establishing the shortest path from no knowledge about a new compound to fixing the limits of one or more of its biological properties. The secret is to use a pattern of increasing dosages based on a logarithmic rather than an arithmetic table. The difference is the same as the difference between a table of compound interest and a table of simple interest. This has been attempted in the past, although not on a fully systematized basis.

In the Foster D. Snell laboratories, all of the work with a new compound is done with logarithmically related dosages, from the first orientation work to refined tests in which the precise effective—or toxic—concentration of a new compound is arrived at. Procedures hitherto accepted frequently required the use of many groups of ten animals each in the later stages of an investigation of a new compound. By using logarithmic scales throughout, the refined data may often be obtained with a single group of ten animals, using a sliding scale of doses instead of a uniform dose.

In addition, the sliding scale or logarithmically graded doses give a more reliable result than the fixed dose. The latter may even give a misleading result. This is especially true in seeking data on new compounds tending to give variable results.

The system applies to a variety of materials. One example involved a hair tint, ordinarily considered safe, but possibly poisonous should the preparation be accidentally taken internally instead of being applied to the hair. The mixture was one likely to give variable results in toxicity

---

SUBSIDIZE 'EM

"We must even treasure the freedom to go broke. How else will we get rid of the inefficient and those who do not serve the public well."

ROBERT E. WILSON,
Chairman of the Board
Standard Oil Co. (Indiana)

testing. Using the logarithmic scale of doses in tests on rats, the level was soon found at which the mixture became toxic. The tests showed that one hair "treatment" could probably be taken internally by a child with little risk of poisoning. Should the child get hold of several "treatments" however, the results would likely be serious.

Another type of test where the sliding dosage scale proved useful was in trying out chemical intermediates which may never be used in the home and may never even enter commerce, but which may be important in synthetic processes in chemical manufacturing. With logarithmic screening it is possible to find out promptly whether such compounds are a hazard to the workmen or technical personnel in the chemical plants handling them. Examples cited included intermediates used to synthesize some of the newer insecticides. In some of these cases there is a serious industrial hazard despite the fact that the insecticides, properly used, are not dangerous.

The Snell system is based on one continuous and standard table of dose figures, printed up and coded for screening or final experiments.

L. C. Cartwright, A. Haldane Gee and Irving L. Seidenberg, Foster D. Snell, Inc., before the International Congress of Pure and Applied Chemistry, New York, Sept. 11, 1951.

RADIATION DETECTION

. . . *Cheap, Simple Method*

Samuel A. Goldblith, et al

Using methylene blue may be a cheap, visual way of measuring exposure to radiation. The dye becomes discolored during exposure to a beam of high energy electrons.

The amount of change in color, particularly in aqueous solutions gives a quantitative measure of the radiation.

The dye color change was studied in a search for a rapid, routine way of determining how deeply radiation penetrates into food and drug products during sterilization by cathode rays, and how wide an area is covered by the radiation.

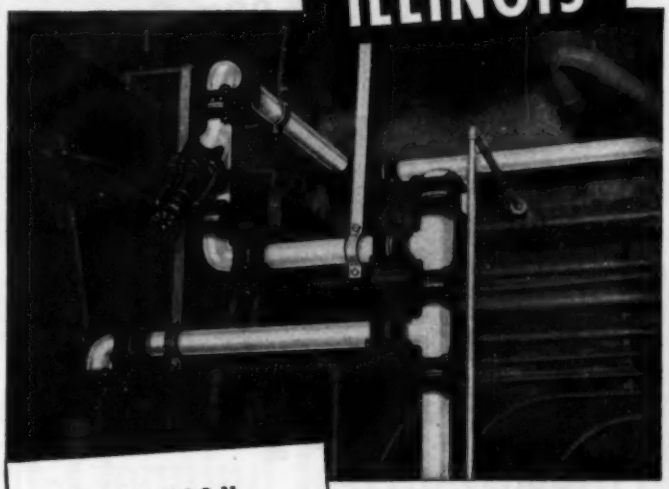
Research over the past decade has shown that the sterilization of food and drugs by the use of radiation, without heat, may soon be a reality. Such a simple and cheap method of measurement is needed if beams of high energy cathode rays are to be used for this purpose.

The dye change may also have other uses.

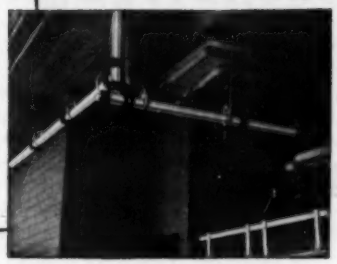
The interesting possibility of using

(Continued)

POWER COMPANY INSTALLS ILLINOIS



CORROSION RESISTANT PORCELAIN PIPE, VALVES AND FITTINGS!



CENTRAL Illinois Public Service Company uses Illinois chemical porcelain pipe, valves and fittings in its Meredosia Power Station at the discharge of alum treating tank. Other Illinois installations at this station include the vent and drain piping from the battery room, and laboratory drain.

Illinois chemical porcelain's non-absorbent super-smooth inside surfaces prevent wear and abrasion and combined with its strong, fracture-resistant walls make it the ideal material for *permanent* fluids handling systems.

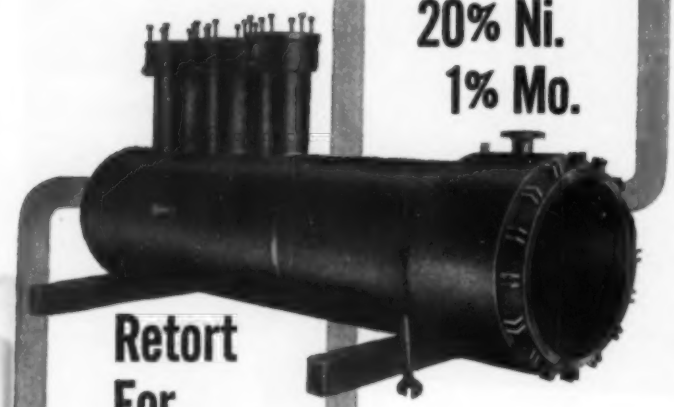
Keep your systems in constant operation — reduce production losses caused by frequent replacements of pipe, valves and fittings—specify and use Illinois acid and alkali-resistant porcelain.

Write for Free Copy of Catalog C-3!

CHEMICAL ILLINOIS ELECTRIC PORCELAIN CO. MACOMB, ILLINOIS

DURASPUN

30% Cr.
20% Ni.
1% Mo.



Retort For Defense Project

Perhaps the most interesting feature of this Duraspun High Alloy Casting is that four different sizes of centrifugal castings are involved. These vary from 34" to 3½" in diameter. Sections, outlets, collar bands, lugs etc., were all welded together in our shop to form the retort as you see it in the picture. Assembled weight runs around 7,464 pounds.

High alloy castings is our business—not merely the adjunct of an extensive steel founding business. We have the experience — 30 years in the static casting division and 20 years on centrifugal castings. We pioneered both kinds for castings in this country. And we have excellent testing and checking facilities, including a 400,000 volt X-ray machine and gamma-ray units.

If you would like this combination of wide experience, modern shop practice, up-to-date equipment and full testing facilities working on your next high alloy casting, bring it to us.

THE DURALOY COMPANY

Office and Plant Scottdale, Pa. | Eastern Office 12 East 41st Street, New York 17, N.Y.

Detroit Office: THE DURALOY COMPANY, 805 New Center Building

Atlanta: J. M. TULL Metal & Supply Co. | Chicago: P. O. NELSON 332 S. Michigan Avenue | San Francisco: JOHN D. FENSTERMACHER 1281 Taylor Street

QED, cont. . .

dyes as inexpensive visual radiation monitors is now being investigated.

When an agar-gel containing resazurin is exposed to cathode rays, the area exposed to the radiations may be seen without the acid of any instrument, because of the change in color of the dye. The extent of decoloration is proportional to the radiation dose.

The extent of penetration of the radiations is also indicated by the depth of the color change. By chemical means, therefore, it is possible to study the degree of penetration, the area covered, and the distribution of the radiations in containers such as cans, glass bottles and plastic films.

More quantitative evaluation of these phenomena can be made by measurements, with a photoelectric colorimeter, of the concentration of methylene blue in aqueous solutions in glass ampules before and after irradiation. The data obtained indicate that methylene blue in aqueous solution is decolorized by supervoltage cathode rays, with probable disruption of the methylene blue molecule, and there is no return to the original color.

Several applications may be made of the phenomenon of destruction of methylene blue in aqueous solutions. The phenomenon may be used as a chemical method of dosimetry.

The efficiency of different types of radiation may be ascertained by comparing the sterilization dose of radiation obtained with one type with the doses noted with other types.

A procedure has been developed for quantitative studies of beam distribution by passing a set of vials (laid side by side) of aqueous solutions of methylene blue under a radiation beam and calculating the percentage destruction of the dye in each vial.

The same type of study can now be used to evaluate the efficacy of foils as scattering material for the cathode ray beam and calculating the percentage destruction of the dye in each vial.

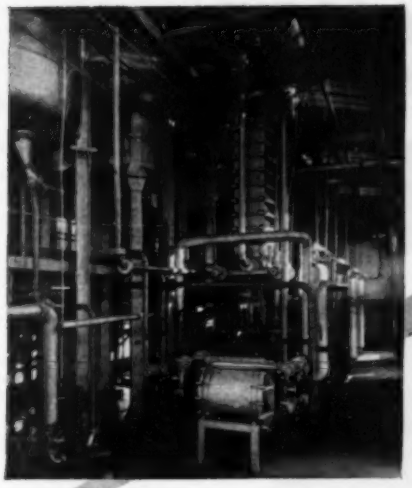
Samuel A. Goldblith, Bernard E. Proctor and Olivia A. Hammerle, Massachusetts Institute of Technology, before the International Congress of Pure and Applied Chemistry, New York, Sept. 10, 1951.

(Continued)

TIME, TIDE AND PROFITS

"A shut down means a loss of revenue of $1,500 an hour to a $12 million business that runs 95 percent of the year."

R. D. Boutros
Chief Engineer
Mixing Equipment Co.



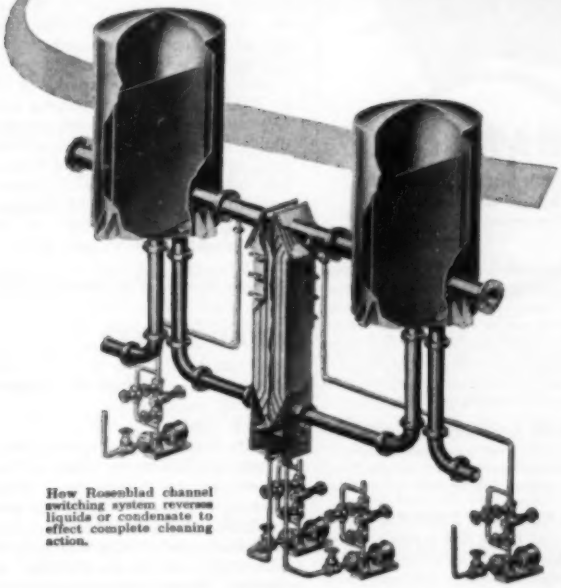
Evaporator installation with Rosenblad* channel switching system

*Patents applied for

No loss of "on-stream" time!

CONKEY EVAPORATOR WITH ROSENBLAD* CHANNEL SWITCHING SYSTEM...

Self-Cleaning In Operation!



How Rosenblad channel switching system reverses liquids or condensate to effect complete cleaning action.

Now you can get *continuous full-capacity* operation . . . by using Conkey flat plate heating surface evaporators arranged in multiple effects with Rosenblad channel switching system. The Rosenblad channel switching system thoroughly cleans heating surfaces, interconnecting piping and pump systems *while in normal operation*. It eliminates expensive "down-time" or production loss for costly cleaning operations because of lime salts dropping out of solution and practically insulating the heating surface from further heat flow.

Rosenblad channel switching systems have been completely tested and proven both in this country and abroad. Results have been outstandingly successful.

Get all the facts . . . see how you can produce more, save more, with a combination of Conkey evaporators and Rosenblad channel switching system.

Write for Bulletin Today.

GENERAL AMERICAN TRANSPORTATION CORPORATION

PROCESS EQUIPMENT DIVISION

Sales Offices: 10 East 49th Street, New York 17, New York

General Offices: 135 South LaSalle Street, Chicago 90, Illinois

PROCESS EQUIPMENT DIVISION GENERAL AMERICAN TRADE MARK

OFFICES IN PRINCIPAL CITIES

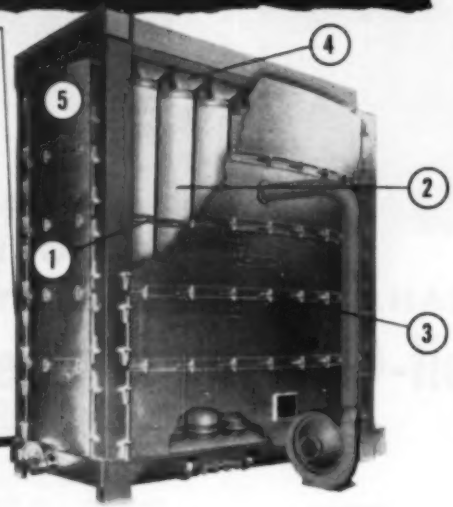
Sole licensee in the U.S.A. for the A. B. Rosenblads Patenter Evaporator Switching System.

Other General American Equipment: Turbo-Mixers, Evaporators, Thickeners, Dewaterers, Dryers, Towers, Tanks, Bins, Pressure Vessels

ABSOLUTE RECOVERY OF THE FINEST DUST PARTICLES

DAY TYPE "AC" DUST FILTER

- 99.998% COLLECTION EFFICIENCY
- NO CLEANING SHUTDOWNS
- HIGH AIR TO CLOTH RATIOS
- SPECIAL FELT FILTER CLOTH



Licensed by M. J. Harvey, Jr.

The DAY Type "AC" Dust Filter provides more efficient filtering for many chemical dusts.

Here are several reasons for this outstanding performance, and why you can rely on the DAY Type "AC" Dust Filter to meet your dust filtering problems more efficiently and economically:

1 CONTINUOUS-AUTOMATIC OPERATION: reverse jet rings travel slowly up and down the tubes cleaning them continuously with a maximum cloth area loss of only 1⅛% at any time. This eliminates cleaning shutdowns and provides continuous, automatic operation with constant air volume.

2 SPECIAL FELT FILTER CLOTH: the gentle, yet positive reverse jet cleaning action permits the use of this high grade wool filtering fabric which collects even the finest dust particles. (Actual tests have shown up to 99.998% collection efficiencies.) Also, the use of this type of cloth allows higher air-to-cloth ratios of 10, 15 or even 20 to 1 with uniform back pressures.

3 OUTSTANDING ADAPTABILITY: units can be furnished in multiples of 4 tubes; sectionalized steel panel housings (see illustration) for filters requiring vacuum or outdoor installations; quick opening clamps simplify erection and permit removal of sections for easy access to filter. (The DAY Type "AC" Dust Filter can be supplied without housing where housing is not essential.)

4 NO DUST CATCHING LEDGES: DAY Type "AC" Filters with a pattern of square-to-round inlet fittings, have no flat surfaces where dust can accumulate and become contaminated.

5 SEPARATED DUST STREAMS: one DAY Type "AC" Dust Filter is able to handle as many as four different product streams simultaneously, without mixing.

WRITE-TO-DAY FOR BULLETIN 491

Visit our exhibit at the 23rd Chemical Industries Exposition, Nov. 26 to Dec. 1, 1951, Grand Central Palace, New York.

DAY SINCE 1881

The DAY Company

856 3rd Ave. N. E., Minneapolis 13, Minn.
IN CANADA: P. O. Box 70N, Ft. William, Ontario
Branch Plants in Ft. Worth, Buffalo and Welland, Ontario

QED, cont. . .

BITUMEN

. . . From Alberta Sand

L. E. Djingheuzian and T. E. Warren

The bituminous sands of northern Alberta are potentially a large source of liquid fuels, and areas of adequate extent and grade to support a major industry have been discovered. The nature of the bitumen and its mode of occurrence, however, are such that commercial development will be feasible only after some complex technological problems have been solved. One of these is to devise a method for efficient and economic separation of bitumen from sand. One such method is the cold water separation.

This consists basically of:

1. Adding a diluent, water, alkaline reagent, and wetting agent to bituminous sand.
2. Disintegrating mixture in a pebble mill.
3. Diluting with water, separating major part of the sand in a classifier.
4. Settling out water and finely divided inorganic matter in thickeners. Diluent is then distilled from the oil product and recycled.

This procedure was conducted in a pilot plant having a capacity of 200 to 300 lb. per hr. of bituminous sand. Ore dressing machinery of standard design was used for all hydrometallurgical operations. Recovery of total oil was ordinarily about 97.5 percent, and the net recovery of bitumen, allowing for replacement of lost diluent, was about 95 percent.

L. E. Djingheuzian and T. E. Warren, *Canadian Journal of Technology*, **29**, 170-189.

ATOMIC POWER

. . . What It Augurs

John J. Grebe

New developments, such as atomic power, produce many values of basic importance to society as a whole. Making power at a moderate price, available at out-of-the-way places, potentially opens up new areas for the production of food, clothing and shelter. Atomic energy can make it

---

KEEP 'EM GUSHING

"The oil industry today is producing and marketing about 25 percent more oil and oil products than at the peak of World War II."

PAUL ADCOCK
Assistant Division Manager
Mid-Continent Oil Co.

possible to develop essential industry based on the cheapest and most available raw materials wherever the climate and the fresh water supply is adequate to sustain new populations. Air, water, clay, salt and coal, oil, gas, or wood can be converted by cheap power into almost all the necessities for clothing, housing, transportation, and education.

We can count on atomic energy to help make possible the continuation of the remarkable growth curve of the United States. New England, for example, can once again become a most potent area for growth and production. The whole of our northwest area, blessed with much water and a good climate, as well as essential minerals, can become a new "new country." Other parts of the world have much more to gain than these areas of the United States. For example, we think the United Kingdom should lead the world in the early production of atomic power. The nations of the world will have less cause to be jealous of their neighbors' fuel resources. The average rock in the continents contains 10 to 20 ppm. of uranium, plus thorium, which with breeding, means that this average rock is equivalent to 20 to 50 times its weight of coal.

John J. Grebe, Dow Chemical Co., before the International Congress of Pure and Applied Chemistry, New York, Sept. 10, 1951.

MAINTENANCE

. . . *Problem Is People*

Lyman A. Darling

In the year 1948, the maintenance cost of a representative group of chemical companies was reported to be roughly equal to half their profits. In the same year, maintenance cost was equal to about 7 percent of the gross property valuation of this group. These figures show the amount charged to maintenance but they hardly tell the full story. They do not show the cost of inadequate maintenance and idle equipment, or yield losses and degraded product which occurred because equipment was not functioning properly.

Chemical plants vary widely in product, process and size. Even when the plants are similar, the functions assigned to the maintenance department in different plants may vary quite widely.

But in all cases, the most important factor in the maintenance problem is people.

The need for competent supervision has long been recognized but I ques-

(Continued)

SARAN LINED steel pipe

WHAT part of industry's six billion dollar corrosion bill are you paying? Any amount is too much and can be cut considerably through the installation of saran lined steel pipe. You will find, as have many of the country's leading manufacturers, that saran lined steel pipe means dependable, long term operation. In addition to the excellent corrosion resistance of this remarkable pipe —you have the plus values of rigidity, pressure strength and ease of installation, requiring NO special tools. These advantages are all important to you in the reduction of shut-down time, lost production and equipment replacement.

Saran lined steel pipe is manufactured by The Dow Chemical Company. For full information, mail this coupon today to The Saran Lined Pipe Company.

Distributed by

Saran Lined Pipe Company

2415 BURDETTE AVE. • FERNDALE, MICHIGAN
With Offices in: New York • Boston • Philadelphia Pittsburgh • Chicago • Tulsa • Portland • Indianapolis San Francisco • Houston • Denver • Seattle • Los Angeles • Cleveland • Charleston, S. C. • Toronto

send today!

Please send me a copy of your catalog on Saran Lined Pipe, Valves and Fittings.

Name_____

Title_____

Company_____

Address_____

City_____

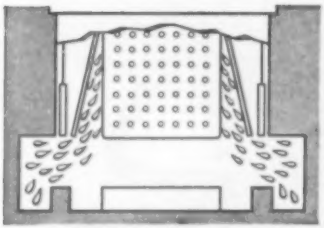
State_____

SP- 45

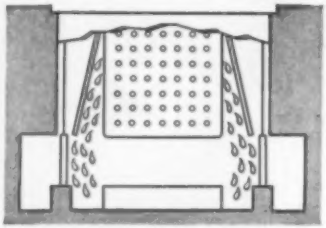
SARAN LINED PIPE
a
DOW
product

LOOK!

2 successive liquids separated without mixing



CURB OPEN to permit first liquid to be separated and evacuated from machine.



CURB SHUT, second liquid is separated and removed through lower outlet without mixing with first liquid.

Industry benefits from broad use of centrifuging . . .

thanks to new AT&M developments. The centrifugal above — a profitable investment wherever two or more liquids are separated in a cycle — is but one of many outstanding AT&M centrifugals that save time, space, costs.

As the drawings above show, this curb is designed to remove two *successive* liquids without mixing. With the curb open, the first liquid is separated and evacuated through the curb outlet. The curb is then closed and the second liquid is separated and removed through a different outlet.

You, too, can benefit with AT&M equipment. Does away, in many instances, with settling tanks, filter presses, squeeze rolls, vacuum presses. Used in processes involving chemical preparations — explosives — nitrating — acid wringing — ammonium sulphate — food products — soap — drugs, medicines, cosmetics — oils and greases — paints, varnishes — ceramics, brick, clay — fertilizers — nitrates — sludges — textiles — carbonizing (textiles) — plastic bases.

Find out now how AT&M centrifugals can help you. Send for free booklet today.

P.S. PROVE TO YOURSELF how centrifuging can benefit you. Send us a sample of your material for centrifuging to your specifications or rent an AT&M laboratory centrifugal for your own tests at a nominal fee.

FUME-PROOF. No gases can escape from this specially designed AT&M centrifugal. Its fume-tight hood — originally developed by AT&M engineers to solve a special problem — is now used to advantage by many firms processing volatile liquids.

FREE
ILLUSTRATED BOOKLET

AMERICAN TOOL & MACHINE COMPANY
1415 Hyde Park Avenue, Boston 36, Mass.

Please send me my free copy of the new AT&M booklet "Centrifugal Force." I am interested in the following processes:

Separation ☐ Extraction ☐ Dehydration ☐ Clarification ☐ Coating ☐
Filtration ☐ Draining ☐ Thickening ☐ Impregnation ☐ Sedimentation ☐

ANY OTHER PROCESS.....

Name.....*Title*.....

Company.....

Street.....

City.....*Zone*....*State*.....

SAVE TIME, SPACE AND COSTS WITH A.T. *and* M. CENTRIFUGING

QED, *cont. . .*

tion if we in the chemical industry have done enough to provide the number and caliber of maintenance supervisors we will need in the years ahead. It takes a good engineering education, character and energy, an interest in maintenance, and years of experience to develop a good maintenance supervisor. What inducement do we offer a talented young man to enter the maintenance field? What about a career in maintenance or one that is founded upon experience in maintenance? Will that attract some of the country's best young brains?

I have talked to a sufficient number of talented young maintenance engineers and some not so young, to be alarmed at the prospect. They point out that the record seems to indicate that a young man starting in maintenance can hardly aspire to reach a high place in industry. I can point to some notable exceptions but cannot prove to these men that their fears are groundless. Some of our best prospects for the future are seeking a way to get out of maintenance. This in the face of a rapid increase in the mechanization of the chemical industry. Our equipment is becoming more complex and costly, our service conditions are becoming more severe, and our maintenance costs are rising. We have already reached a maintenance barrier at some points in our technological advance so it would seem prudent to take steps to attract and hold in maintenance, part of our best talent.

Lyman A. Darling, E. I. du Pont de Nemours & Co., before the American Institute of Chemical Engineers, Rochester, Sept. 16, 1951.

SULPHURIC RECOVERY

. . . From Pickling

F. J. Bartholomew

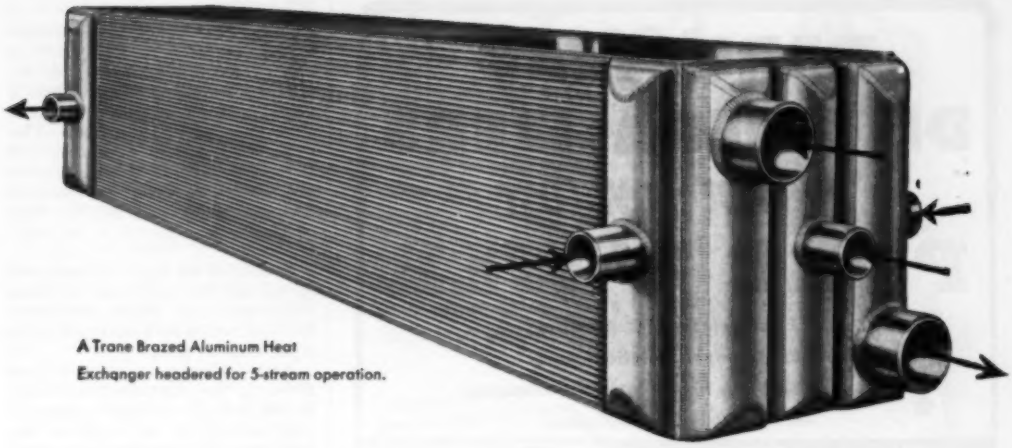
A new sulphuric acid recovery process for steel mills, oil refineries and titanium pigment plants has been developed.

The new process recovers 85 to 90 percent of the acid normally discarded in the pickling operation of a steel mill, including the acid contained in the iron scale and rust.

Object of the recovery process is to return the sulphuric acid remaining in the used pickle liquor to the pickling operation for re-use to recover the acid in the iron sulphate of the scale, and to return the rust and scale to the blast furnaces as iron oxide.

It involves separation of the iron sulphate by crystallization, after con-

(Continued)



A Trane Brazed Aluminum Heat Exchanger headered for 5-stream operation.

This Single Brazed Aluminum Heat Exchanger

Handles FIVE Fluids Simultaneously

Trane Brazed Aluminum Heat Exchangers can be designed to handle up to five streams, or even more, at the same time – and meet the heat transfer needs of each stream accurately and efficiently.

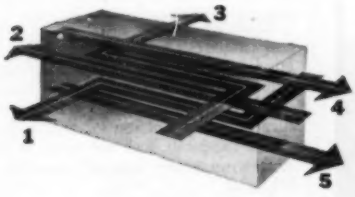
A single unit can be made to handle two, three, four, five or even more different liquids or gases. Headers are designed specifically for your installation. You can take any stream off at any point in the exchanger. You can split a stream, taking part off at one point in the unit at a given temperature and pressure, the rest off at another point at different conditions. The units provide just the heat transfer, pressure drop, volume, velocity, number and direction of passes needed for each stream.

And the units can meet these heat transfer specifications in the most limited space. That's because the Trane Brazed Aluminum Heat Exchangers pack up to 450 square feet of heat transfer surface into one cubic foot – nine times more than a tubular exchanger with ¾" tube.

Since a smaller unit can do a bigger job, *Brazed Aluminum Heat Exchangers can often replace tubular exchangers costing two or three times more and weighing four times more.*

These all-aluminum Trane Heat Exchangers are rugged, too. They take test pressures up to 1,000 lbs. per square inch, and temperatures from –300° to 500°F.

Whether the job calls for high or low temperatures or pressures, for one stream or many – as long as efficiency and economy are important – Trane Brazed Aluminum Heat Exchangers can be the answer. Contact your nearest Trane sales office or write direct.



Symbolic drawing, left, shows one of many ways in which a Trane Brazed Aluminum Heat Exchanger may handle up to five fluids simultaneously.

TRANE

THE TRANE COMPANY, LA CROSSE, WISCONSIN
Eastern Mfg. Division . . . Scranton, Pennsylvania
Trane Company of Canada, Ltd. . . . . Toronto
OFFICES IN 80 U. S. AND 14 CANADIAN CITIES

MANUFACTURING ENGINEERS OF HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

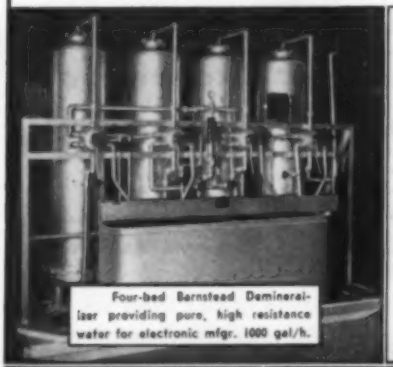
BARNSTEAD DEMINERALIZERS

PROVIDE LOW-COST

PURE WATER

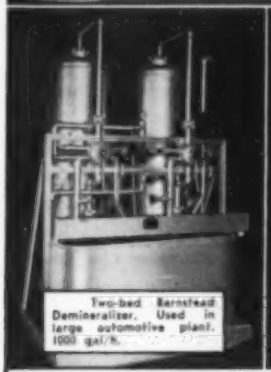
for • Electroplating • Anodizing
• Photographic Solutions
• Salt-free Rinse Water • Silvering

And Hundreds of Other Applications



Four-bed Barnstead Demineralizer providing pure, high resistance water for electronic mfgr. 1000 gal/h.

Barnstead Four-Bed Demineralizer provides pure water for hot seal tank in anodizing. 30 gal/h.



Two-bed Barnstead Demineralizer. Used in large automotive plant. 1000 gal/h.

Four-bed Barnstead Demineralizer produces pure, sparkling-clear rinse water for pharmaceutical plant. 250 gal/h.

Selection of the best size and type of demineralizer for your operation depends on the nature of your raw water supply, flow rate needed, daily demand, and degree of purity required. Send a sample of your water to our Laboratory and Barnstead Engineers will perform the necessary analysis without obligation.

PROMPT DELIVERIES

Barnstead
STILL & STERILIZER CO.
4 Lanesville Terrace, Forest Hills, Boston 31, Mass.

centrating the liquor by submerged combustion in a special burner in which oil flames blaze beneath the surface of the liquid. The sulphate is filtered out of the liquid on a plastic filter supported by a lead frame. This sulphate is mixed with coal and roasted to produce sulphur dioxide gas, which can easily be converted back to sulphuric acid, and iron oxide which can be returned to the blast furnace.

Because of the high investment required and the cost of fuel for water evaporation, it is difficult to show a favorable return on a steel mill pickle liquor recovery plant.

Acid pickling is a very minor item of cost on the steel maker's books and he will probably continue to dump his waste as long as he is able to buy fresh acid at reasonable cost and is not prevented from dumping it. A shortage of acid and restrictions against dumping it would alter the situation.

The recovery situation is somewhat different as it applies to titanium pigment manufacturers. The byproduct from this industry is in such form that recovery is economically feasible. Some objections have been raised by pigment manufacturers, stating that the acid recovered by concentration carries impurities that would contaminate the pigment if the acid were re-used. However, there would be a ready market for the recovered acid in other industries and roasted sulphate would produce an acid of a purity suitable for any purpose.

The process cannot be utilized economically in all cases but it is a practical one and can be applied when a scarcity of raw materials or other attending circumstances make it advisable.

F. J. Bartholomew, Chemical Construction Co., before the American Chemical Society, New York, Sept. 7, 1951.

PETROLEUM ORIGINS

. . . *New Theories*

Benjamin Brooks, Robert Stone and Claude Zobell

Evidence that nature employs mineral catalysts in making crude petroleum—just as the modern refinery employs catalysts in making gasoline—has been found. Recent research indicates that petroleum formation deep inside the earth does not occur at the high temperatures formerly considered essential.

In fact, oil field observations as well as chemical considerations suggest that the temperatures involved are in the

range of 100 to 200 deg. F., much too low to be the sole reason for the conversion of organic matter to typical petroleum.

Plausible explanations for the conversion of organic matter into petroleum are the action of bacteria. If petroleum comes from marine sediments, as most petroleum geologists agree it does, then it follows that microorganisms have a part in the initial processes of petroleum formations.

Bacteria in almost any mud sample have been shown capable of forming simple hydrocarbon compounds such as methane, but the formation of the complicated hydrocarbons of petroleum by bacteria has not yet been demonstrated.

Other evidence such as the presence of small amounts of hydrocarbon materials in living organisms, hydrocarbons in the decomposition products of bacteria themselves, and the existence of great numbers of bacteria in places where scientists believe the oil-forming processes are now going on, strongly suggest that bacteria are the key to petroleum.

The fact remains that no such phenomenon has been experimentally demonstrated. Until it is, we must be content with calculations based on the minute quantities of simple hydrocarbons made by bacteria in the laboratory in relatively short periods. Multiplying these periods by hundreds of millions may account for the petroleum deposits existing in nature.

To what extent bacteria function in the actual formation of petroleum hydrocarbons is still an unanswered question.

According to the evidence available, petroleum formation starts with the burial of organic matter, largely fatty oils derived from algae, diatoms and other marine organisms, in ocean muds out of contact with the air.

Bacterial degradation must occur in the very early stage. Then with continued deposition of silt, this organic material becomes sealed in, the sediment is compacted and eventually forms a shale or sandstone.

The changes begin with bacterial action at the ordinary temperatures of sea water. Much later, at slightly higher temperatures, as the heat-insulating blanket of overlying material is built up, the slow changes due to the clays and similar material in contact with heavy bitumens take place with eventual formation of the complex mixture we know as crude petroleum.

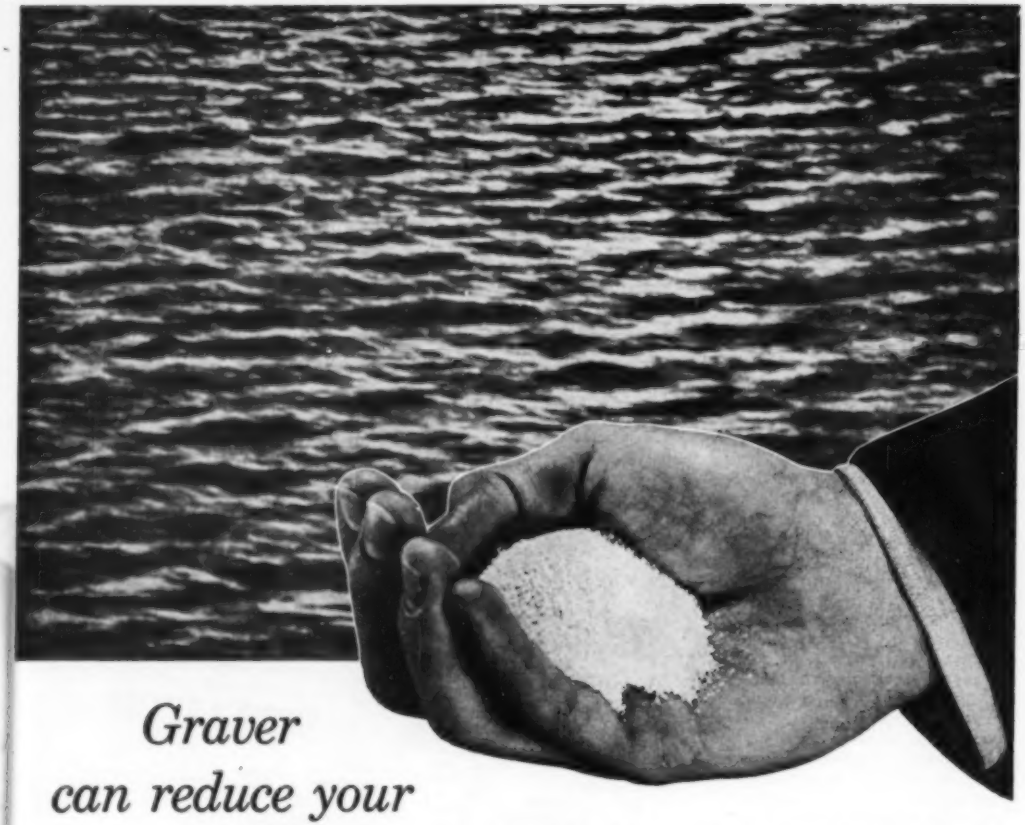
Benjamin Brooks, consulting chemist, Robert Stone, Pennsylvania State College, and Claude Zobell, Scripps Institute of Oceanography, before the American Chemical Society, New York, Sept. 5, 1951.

—End

Up a Tree?

Not enough hours in your day? Here's a handy slide-chart to make your job simpler and save valuable time! This FREE chart instantly identifies A-N Nos. pertaining to stainless steel nuts, screws, bolts, rivets, cotter pins, washers; gives sizes, other data. Write for your FREE copy of Chart 51C TODAY!

Anti-Corrosive
AN STAINLESS STEEL FASTENING SELECTOR
In listing below, find AN number and note kind of fastening. Then, in proper window, set AN number and read data.
NUTS
SCREWS
See other side for RIVETS COTTER PINS WASHERS
AN3 to AN20 Hexagon Head, Fine Thread, Class 3 Fit Aircraft Bolts with hole drilled in shank
C—Corrosion Resisting Steel (Stainless Steel) to Spec. AN-QQ-S-770, Condition QT, Class II (Type 431).
H—Indicates drilled hole in head of Bolt
A—Indicates no drilled hole in shank of Bolt
Last Dash No.—Refer to drawing for length of Bolt
AN310 Castellated Nuts, Fine Thread, Class 3 Fit
AN315 Hexagon Plain Nuts, Fine Thread, Class 3 Fit
AN316 Hexagon Double Chamfered, Double Countersunk Check Nuts, Fine Thread, Class 3 Fit
AN320 Hexagon Shear Nuts, Fine Thread, Class 3 Fit
AN340 Machine Screw Nuts, Fine Thread, Class 2 Fit
AN345 Machine Screw Nuts, Fine Thread, Class 2 Fit
AN381 Corrosion Resisting Steel Cotter Pins to Spec FF-P-386a, Amendment 2, Type C (Type 302)
AN427 100° Flat Counter-sunk Head Rivets
Anti-Corrosive
Metal Products Co., Inc
Manufacturers of STAINLESS STEEL FASTENINGS
CASTLETON ON HUDSON, NEW YORK



Graver can reduce your water solids to

LESS THAN a handful in a million gallons

That's equivalent to water with a purity of 0.1 ppm or 0.8 lb per million gallons . . . practically distilled water.

How does Graver do it? . . . with a MIXED-BED single tank demineralizing unit. Simple in operation, it can even be automatically controlled. Graver cation and anion exchange resins are mixed intimately, and simultaneously remove both cations and anions from the water being treated in this single unit. By combining certain Graver resins the silica in the water can also be reduced to 0.02 ppm and the carbon dioxide content can be reduced to zero.

Graver Demineralizers can accomplish these results in installations ranging in size from small laboratory units to huge plants in central power generating stations. The performance of each Graver installation is *guaranteed* . . . and this guarantee is based on Graver's 40 years of experience in designing successful water treating equipment of every type. Write for complete information.

GRAVER

GRAVER WATER CONDITIONING CO.

Division of Graver Tank & Mfg. Co., Inc.

216 WEST 14th ST., NEW YORK 11, N. Y. • CHICAGO • PHILADELPHIA • CLEVELAND

Joe—You can't beat this Taylor Mercury Manometer for performance. There's no seizing — thanks to TEFLON BEARING

SATISFIED customers tell us the "Teflon" Pressure-Tight Bearing makes the new Taylor Mercury Manometer seize-proof and practically leak-proof. It's ideal wherever you need something *better* than present differential pressure measuring instruments. Teflon is a synthetic plastic that minimizes friction and eliminates seizing common to metal-to-metal bearings. It resists corrosion because of unmatched chemical inertness. That's why this Taylor Manometer ends pressure-tight bearing troubles that may have blocked precise control for years. Other features:

1. Great Power—thanks to extra-big float with extra-long travel. Micro-inch finished shaft with Teflon bearings "float" this power right through to the pen.

2. High Accuracy—inherent straight-line calibration.

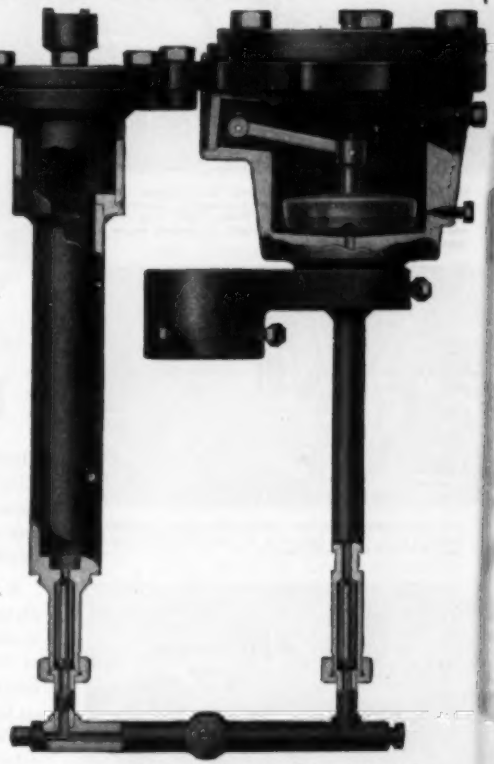
3. Positive Actuation—high energy output. **(a) Big 3 5/16" float. (b) Long float travel—1". (c) Simple lever system. (d) Teflon in pressure-tight bearing surfaces** for efficient use of power. **(e) Jewelled thrust bearing.**

4. Dependable Performance. (a) Submerged check valves give positive shut-off. **(b) Unique damping valve** adjustable under full pressure without leakage. **(c) Ample room** in mercury chambers to accommodate surges or pulsating flows. **(d) Teflon holds pressure,** yet lets shaft turn freely, giving long service.

5. Great Adaptability. (a) Six interchangeable range tubes: 10", 20", 50", 100", 200" and 400" of water. **(b)** All ranges except 10" may be over or under ranged 33⅓%. **(c)** Both side and top pressure connections. **(d) Two manometers** can be mounted on back of single case for recording two Flows or for Ratio-Flow control. **(e)** A union coupling prevents distortion of bearing housing—eliminates binding or friction caused by wrench-torque.

6. Ease of Maintenance. (a) Low pressure chamber cover permits easy access to float and lever arm during calibration. **(b) Entire pressure-tight bearing** easily and economically replaced.

Ask your Taylor Field Engineer, or write for bulletin 98182. Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

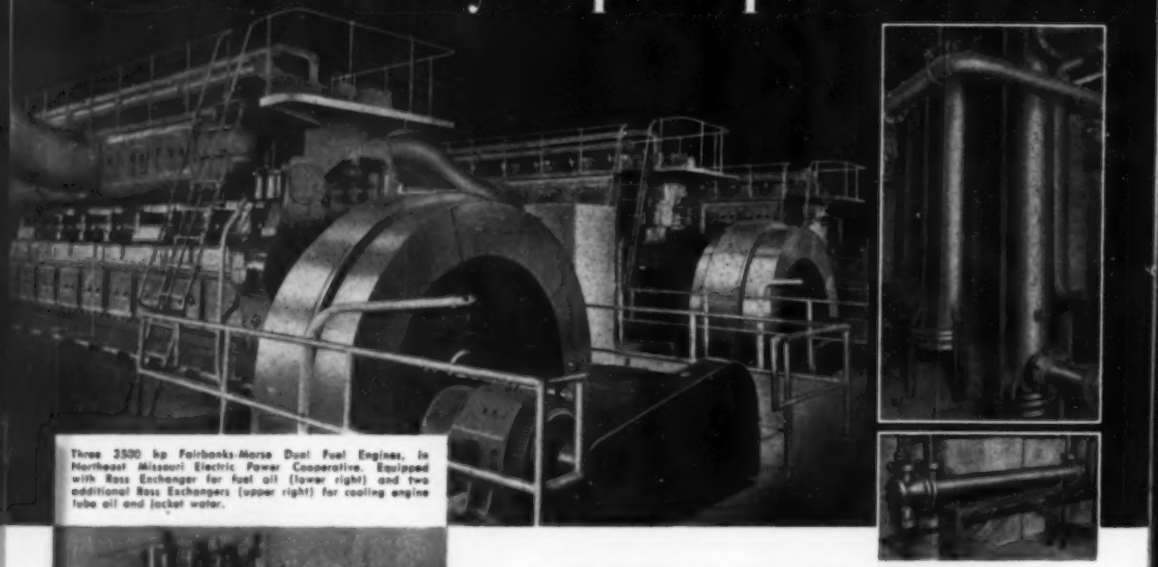


Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

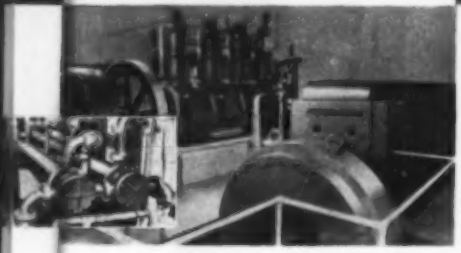
Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

Fairbanks-Morse Diesels

Count on stability of principal accessories



Three 2500 hp Fairbanks-Morse Dual Fuel Engines, in Northeast Missouri Electric Power Cooperative. Equipped with Ross Exchanger for fuel oil (lower right) and two additional Ross Exchangers (upper right) for cooling engine lube oil and jacket water.



480 hp Fairbanks-Morse Dual Fuel Engine in Hugo, Colorado plant of K. C. Electric Assn. Lube oil and jacket water cooling by 2 Ross Exchangers (inset).

Two 1600 hp (left) and two 2000 hp (right) Fairbanks-Morse Dual Fuel Engines supplying power for Halliburton Portland Cement Co., Corpus Christi, Texas. Equipped with Ross Exchangers (inset) for lube oil and jacket water.

2000 hp Fairbanks-Morse Diesel (foreground) newest of 5 totaling 6,725 hp in municipal power plant, La Junta, Colorado. Ross oil cooler (inset) included in engine lubricating system.

That's why *Ross* Exchangers Are Used

They can be producing the power for a portland cement plant with 1,500,000 annual barrel capacity, or for one of the world's largest rural power co-ops serving 55,000 farm homes in 27 counties. In *any* instance, Fairbanks-Morse Diesels go on indefinitely . . . dependably, profitably and with minimum maintenance.

But in order for a Company like Fairbanks-Morse to make such claims for its engines, it has to be mighty confident of its major accessories, too. And Fairbanks-Morse *is* . . . makes a selling point of them by listing the famous makes selected in its bulletins and news releases. Continually, you'll find Ross Exchangers among them — for the lube oil, the jacket water, the fuel oil — whatever heat exchange job is to be done. And the reasons? The same as those of other major Diesel builders: Ross standardization and mass production — a system that cuts engineering and fabricating time and costs; Ross heat transfer efficiency that assures long, continuous service.

For Diesel builder or user, for large or small hp ratings, Ross literature is available with helpful information — Ross engineers are available for consultation. Write.

ROSS HEATER & MFG. CO., INC.
Division of American Radiator & Standard Sanitary Corporation
1411 West Ave. Buffalo 13, N. Y.
In Canada, Horton Steel Works, Limited, Fort Erie, Ont.

ROSS

Standardized EXCHANGERS

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

How Much Does Corrosion Cost Your Company?

Speller reports improved preventive practices for chemical engineers and others interested in cutting down the annual $5,500,000,000 tribute extracted by corrosion.

The third edition of Speller's "Corrosion"* is written in an easy-to-understand manner, except for infrequent anomalies such as "the large amount of data accumulated from such tests in the past 25 yards." It does a good job of interpreting the significance of the new developments in the field of corrosion and placing them in their proper relationship to the old. By new we mean since 1935, year of the second edition.

It's easy to tell where to go for more detailed and/or related information on any subject. Pages not having one or more references are rare. Comprehensive coverage is apparent from the contents listing on this page.

You may recognize as being new the section on cathodic protection (Chapter 15). This method of fighting corrosion by impressing a current counter to that generated by the corrosion process is gaining in importance.

Also new is the section on biological influences in Chapter 5. In the case of barnacles and other marine organisms, electrolytic concentration cells are set up on the metal surface because of poor adhesion and/or irregular thickness of encrustations. This condition, in water containing dissolved oxygen, results in pitting. And there are bacteria which cause deterioration of metals as a result of their metabolic activity.

Of particular interest to chemical engineers are the recent advances in preventive measures throughout Part II. The following excerpts point to a few of these:

Flame-cleaning — "Flame-cleaning has been developed during the last ten years and is a useful method of preparing steel surfaces for painting. The metal scale is rapidly heated by passing a multiple-jet acetylene flame over the surface. Loose scale is thus removed by differential expansion and the metal surface is, at the same time, dehydrated and warmed."

Painting the Cathode, Too—"The factors which cause corrosion should be understood before organic coatings for prevention of corrosion are applied. For example, if a metal is anodic and is corroding at an accelerated rate because it is coupled with a more noble metal, coating the potentially corrodible surface results in more intense attack at discontinuities in the coating and in deep pitting or, in some cases, perforation of the metal. In all cases, both the coupled metals should be coated."

Frank Speller

His new third edition is all about . . .

CORROSION:

Causes . . .

1. Introduction
2. Theories of corrosion
3. Influence of manufacture
4. Influence of composition
5. Influence of external factors
6. Corrosion testing

and Prevention . . .

7. . . . in the atmosphere
8. . . . underwater
9. . . . in closed water systems
10. . . . in steam generators
11. . . . in steam heating systems
12. . . . in chemical industries
13. . . . underground
14. . . . of stray current corrosion
15. . . . by cathodic protection

High Temperature Coatings—"Prior to 1940, no satisfactory paint coating had been developed that could be used up to 600 deg. F. Coatings available up to that time decomposed at 600 deg. F. or lower. At present, silicone resin coatings appear to offer adequate protection up to 600 deg. F. and are resistant for several hours at temperatures up to 1,000 deg. F.

Bimetal Steel Plates—"Bimetal steel plates are now produced on an extensive scale to obtain the high corrosion resistance of a metal such as nickel or stainless steel with a carbon steel backing at a considerable saving in cost of construction. Nickel, Monel, Inconel, and all varieties of austenitic stainless steels are commercially available, homogeneously bonded on one or both sides to plain carbon or lower alloy steels by the heat and pressure of rolling in plate mills at elevated temperatures. The corrosion-resistant alloy may be obtained in 5 to 30 percent of the total thickness of the bimetal plate. These bimetals can also be formed and fabricated by fusion welding, with certain necessary precautions, in the construction of tanks and apparatus for the chemical and allied industries."

Deaerating Heaters—"Modern deaerating heaters of either the jet or spray or the tray type reduce dissolved oxygen below the limits determinable by the most refined testing methods when properly designed and operated."

Vapor Zone Corrosion—"Vapor corrosion losses in chemical plants are particularly severe. An excess of oxygen from the air greatly accelerates the corrosion reaction. This is often true in acid plants, where vapors of hydrochloric, nitric, sulphurous, and other acids may be present. The presence of moisture exerts a marked accelerating effect. Volatile inhibitors which may prove useful in vapor corrosion have been developed recently. Ammonia has given satisfactory service in protection of vapor zone of oil-storage tanks."

For Oil Refineries—"Many corrosion-resistant metals and alloys have been developed for the various requirements of oil-refinery and other services. For instance, from 600 deg. F. up, chromium-iron alloys offer considerable resistance to sulphur corrosion

(Continued)

* CORROSION: CAUSES AND PREVENTION. Third edition by Frank N. Speller. McGraw-Hill Book Co., New York. 686 pages. $10.

FIT A SPECIFIC NEED

Assure Free-Flowing Bins, Hoppers and Chutes with

SYNTRON

"Pulsating Magnet"

ELECTRIC VIBRATORS

with variable control of power

They are designed to meet a specific need—to eliminate the arching and plugging of bins, hoppers and chutes. Their 3600 pulsating vibrations per minute keep even the most stubborn materials flowing evenly thru bins, hoppers, chutes and screens—of any size—providing faster processing of materials without the hammering and rodding that wastes manpower and damages equipment.

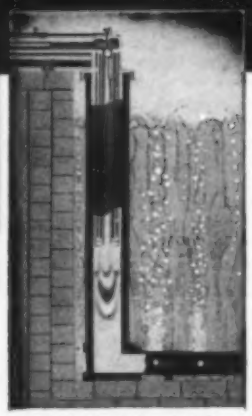
WRITE FOR ILLUSTRATED FOLDER

SYNTRON CO.

818 Lexington Ave. Homer City, Pa.

Submerged Combustion

DIRECT FIRED GAS BURNERS



Exposed view Submerged Combustion Burner as now used to concentrate calcium chloride solution and ferric chloride.

A NEW METHOD FOR

HEATING and EVAPORATING

CORROSIVE AND NON-CORROSIVE LIQUIDS

★ Flame burns below surface, bringing liquid quickly to heat.

★ Hot exhaust gases forced through liquid carry away moisture.

★ Provides rapid evaporation and concentration of acids, salt solutions, suspensions. Also adapted to heating water and solutions.

★ Installed in any type tank. No boiler room required. Use any type gas—natural or manufactured. Automatic in operation.

Free *Send for descriptive circular No. 52 and details*

SUBMERGED COMBUSTION CO.

OF AMERICA, INC.

759 LOGAN STREET HAMMOND, IND.

while, on the contrary, copper and its alloys corrode more rapidly. Thus the stainless steels including chromium-nickel steel of the 18-8 type offer excellent resistance, while the ordinary varieties of steel and the copper alloys have a relatively shorter life under these conditions.

"For oil cracking, polymerization, hydrogenation, and alkylation services, stainless-steel tubes of 18-8 chromium-nickel, plain or stabilized, 16-13-3 chromium-nickel-molybdenum, and 25-20 chromium-nickel are used."—*MMH*

C. F. B.

H. H. D.

Giants They Were

A ROMANCE IN RESEARCH: THE LIFE OF CHARLES F. BURGESS. By Alexander McQueen, with a foreword by George W. Heise and Technical Appendix by Oliver W. Storey. The Instruments Publishing Co., Pittsburgh. 429 pages. $6.

HERBERT H. DOW, PIONEER IN CREATIVE CHEMISTRY. By Murray Campbell and Harrison Hatton. Appleton-Century-Crofts, New York. 168 pages. $3.50.

Reviewed by S. D. Kirkpatrick

When the Electrochemical Society meets this month in Detroit for its 100th convention—two of its charter members will be represented by distinguished proxies—Society President Ralph M. Hunter of the Dow Chemical Co. and Oliver W. Storey of the Burgess Battery Co. But in truth all who attend the sessions will owe a real debt to Charles F. Burgess and Herbert H. Dow—two great giants of the past who pioneered the electrochemical industry and profession in this country.

Fortunately for all of us, excellent biographies of Burgess and Dow are now available. Both books have been prepared by talented writers with the full support of former associates in the Burgess and Dow companies. Neither are eulogies of the men nor overly

(Continued)

PRODUCT CONTROL THROUGH INFRARED ANALYSIS

Number 3 *of a Series of Data Sheets for Better Process Control from The Perkin-Elmer Corporation, Norwalk, Conn., Manufacturers of Infrared Spectrometers, Flame Photometers and Electro-optical Instruments.*

PROBLEM:

1) Raw material selection and control;
2) Control of finished graphic arts products.

PLANT:

A. B. Dick Company, Niles, Illinois.

SOLUTION:

Infrared analyses on raw materials and finished products for:

a) presence of aldehyde impurity in alcohol (shown in few minutes at 5.8 micron band)
b) differentiation between technical and 99% grades of ethyl acetate (by intensity of hydroxyl absorption band)
c) identification of oils on purchased oiled papers (IR analysis saves 2 days time)
d) composition of plasticizers in sheet plastics
e) composition of paper coatings
f) identification of natural waxes (reference spectra used for d, e, f, g)
g) quality control of finished inks and stencil sheet coatings (See Fig. 1)

DISCUSSION:

Most infrared controls completed in 2 minutes compared with 2 days for classical methods.

INSTRUMENTATION:

Commercial infrared spectrometer and standard accessories.

REFERENCE:

Anal. Chem., 23, 4, 1951.

CONCLUSIONS:

Infrared analysis on a variety of complex raw materials and finished products proves timesaving and accurate.

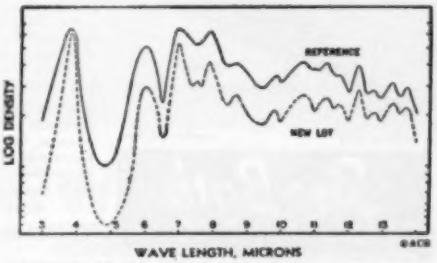


Fig. 1—Infrared Spectra for Process Control of an Ink.

Fig. 2—Product Control with Perkin-Elmer Spectrometer at A. B. Dick Co.

Let us discuss your Product Control Problems with you.

THE PERKIN-ELMER CORPORATION

Optical designers and manufacturers of electro-optical instruments

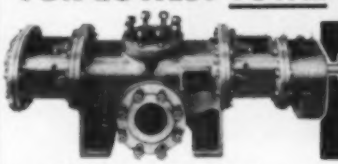
NORWALK, CONN.

ARE YOU RECEIVING INSTRUMENT NEWS?

This 8-page quarterly brings you the latest developments in electro-optical instrumentation as well as their application to research and process control.

PUMP ABRASIVE MATERIALS?

FOR LOWEST TOTAL COST, Specify...



Sier-Bath SCREW PUMPS

● Pump shown: new External Gear & Bearing Bracket Type for non-lubricating fluids, semi-fluids. Capacities 1-700 GPM; Discharge 1000 PSI for viscous liquids, 300 PSI for water.

BEST BUY FOR PUMPING COAL TAR, ADHESIVES, SOAPS, CRUDE OILS, ETC.

In selecting pumps for abrasive materials applications, be sure to consider *total* cost. Sier-Bath Screw Pumps—though their original cost is higher than gear pumps—in the end cost *less*. The reason: considerably lower maintenance costs. Major over-hauls are simple, inexpensive. They thus enable you to keep your installation running at top efficiency—*without* sky-rocketing your pump costs.

ROTORS INEXPENSIVELY REPLACED

CASINGS INEXPENSIVELY RE-GROUND

Sier-Bath Screw Pumps are available in horizontal or vertical construction, corrosion resistant alloys. Special bodies, stuffing boxes and bearings for high temperature applications. Sier-Bath "Gearex" Pumps for lower pressures and capacities.

WRITE FOR BULLETIN!

Founded 1908 Member A.G.M.A.

Sier-Bath GEAR and PUMP CO., Inc.

9259 HUDSON BLVD., NORTH BERGEN, N. J.

Also Manufacturers of Sier-Bath Gear Couplings and Precision Gears

SILICATE P's & Q's

Silicate P's & Q's, PQ Co. house organ is a monthly message to those who use or could use silicates. Sample copy mailed on request.

Fireproof Coating 1.

The fireproofing property of silicate of soda* is used in many compositions. A patented mixture includes ground mica, a small amount of Chinawood oil and mineral oil. Proportions may be varied to produce a thin paint or a soft mortar suitable for wall board. Dries to the touch in ½ hour—hard and tough in 24 hours. When tested with a blow torch a series of stratified blisters formed which protect the base from ignition. Send for File #29-2.

Wire Drawing Simplified 2.

A patented process consists of dipping the pickled steel rod for a few seconds in a dilute silicate* solution near boiling temperature. This dries rapidly without baking. Silicate serves as effectively as lime for collecting the lubricant as the wire is drawn. Eliminates the need for a rust coating and doesn't abrade the die. Send for File #31-7.

*NS

SOLUBLE SILICATES FOR INDUSTRY

PHILADELPHIA QUARTZ COMPANY

1125 Public Ledger Building, Philadelphia 6, Pa.

generous records of their companies' achievements. Both are full of facts and figures about mistakes as well as successes, about problems of money and people, of science and technology.

Of the two, I like the Burgess book the better. It is a warm, more human story—perhaps because it more accurately reflects the lovable qualities of its subject. Although Charlie Burgess was my senior by more than twenty years, I enjoyed his companionship on many occasions. In fact, I was on the program with him at the Electrochemical Society meeting in Chicago less than a month before he was fatally stricken. He told me then, "I am very tired"—yet he was willing and anxious to carry on for the people and the society he loved.

Alexander McQueen, a freelance writer, has done a masterful job in recounting so many interesting phases of the Burgess career. You will find delicious bits of CF's infectious humor—as, for example, the story of how he founded and fought for the first chemical engineering course at Wisconsin—even to the extent of personally casting its name in "immortal bronze" letters that were surreptiously installed one night over the main entrance of the old chemistry building at Madison.

In outlining his chemical engineering courses—which, incidentally, he first described in this magazine's Volume I Number 1 page 9 Burgess turned to his friend Herbert H. Dow for criticism and advice. Although even then known for his great loyalty to Case, Dr. Dow took a great interest in what his Badger friend was trying to accomplish in wedding chemistry and electrical engineering.

But George Heise hit on the real keynote of Burgess' career: "self-dedication to applied research, applied with inspiration and joy . . . to become an instrument of service to mankind."

Dr. Dow's biographers are also gifted and proficient writers. Murray Campbell, formerly master of the McDonough School in Maryland, has authored dozens of articles in the *Satevepost*, *Fortune*, *Colliers*, and the *Woman's Home Companion*. All deal with human aspects of business and industry. Harrison Hatton developed his interest in history and industrial interpretation while a research associate of Senator Joseph H. Ball. I mention these backgrounds because they are so clearly reflected in the Dow book.

Although titled as a biography, it is essentially a history of the Dow Chemical Co. and its industrial ante-

cedents. To be sure, it is a story that cannot be told except in terms of what its founder accomplished in the face of almost insurmountable obstacles. First there were fights for funds and the discouraging failures of the earliest ventures. Then came disagreements over policy when Dow was determined to branch out into new fields and thus lay the foundation for a diversified chemical industry. As the business succeeded in the face of ruthless competition, especially from abroad, Dr. Dow was quietly bringing together a strong loyal group of associates. It was this impetus and inspiration that in 1930 he passed on to his son Willard as his greatest heritage. And, in turn, the same energy and zeal now carry the Dow Chemical Co. to far greater heights than ever envisioned by its founder fifty years ago.

Again I say we are fortunate to have books like these to remind us that there were giants in those days—hardy pioneers whose work made possible so much that we know and enjoy today.

I.G. History

CHEMIE EROBERT DIE WELT. By Walter Greiling. Econ-Verlag, Düsseldorf, Germany. 396 pages.

Reviewed by F. C. Nachod

The impact of modern chemistry on our life is felt keenly not only in the United States but also abroad. Not only the scientist but the lay public has taken great interest in the achievement of the chemist and the chemical engineer. The present book (Chemistry Conquers the World) is aimed at

(Continued)

RECENT BOOKS RECEIVED

Agricultural Chemistry. Vol. II. By D. E. H. Frear. Van Nostrand. $9.50.
The Chemistry & Technology of Food & Food Products. Vol. II. 2nd ed. By M. B. Jacobs. Interscience. $15.
Combustion, Flames and Explosion of Gases. By B. Lewis & G. von Elbe. Academic. $13.50.
Fuel Oil Manual. By P. F. Schmidt. Industrial. $3.50.
Heat and Thermodynamics. 3rd ed. By M. W. Zemansky. McGraw-Hill. $6.50.
Mathematical Engineering Analysis. By R. Oldenburger. Macmillan. $6.
Mathematics for Engineers. 3rd ed. By R. & R. Dull. McGraw-Hill. $7.50.
Phase Transformations in Solids. Wiley. $9.50.
Punched Cards. By R. S. Casey & J. W. Perry. Reinhold. $10.
Quality Control Handbook. By J. M. Juran. McGraw-Hill. $10.
Top Management Organization and Control. By P. E. Holden. McGraw-Hill. $5.50.
Textbook of Electrochemistry. By G. Kortum & J. O'M. Bockris. Elsevier. $7.

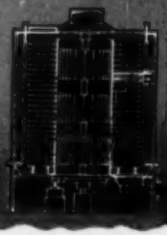
For
SLURRIES • SLUDGES • PASTES • CRYSTALS • CHIPS • POWDERS • GRAINS • SEEDS

The VERTICAL TURBO-DRYER
CONTINUOUS TRANSFER TYPE

Combines— with—
Gentle Handling — Low Power
Uniform Drying — Reduced Space
Dustless Operation — Low Maintenance
High Efficiency — Low Dust Losses

• FOR DRYING
• COOLING
• SUBLIMATION
• OXIDATION

Available in packaged unit for pilot plant and small production. Field erected units up to 25,000 lb. evaporation per hour.



Agents in Principal Cities
WYSSMONT COMPANY

Schmieg CENTRI-MERGE
Still the Best Answer to Your
DUST and FUME PROBLEM

CENTRI-MERGE is COMPLETELY automatic in every phase of operation, COLLECTS dust and fumes as soon as they occur, CLEANS by high pressure water action, DISPOSES by mechanical conveyor. Dust and fumes are forced back on a stream of air to collection unit, washed and scrubbed from the air into tank below, permanently trapped under water for quick disposal as sludge.

Our engineers will be pleased to consult with you in the solution of your problem.

Here are Several Reasons Why—

1. CENTRI-MERGE greatly reduces heating cost by re-circulating cleaned air in many cases, occupies a minimum of valuable floor space, is easily installed.
2. CENTRI-MERGE gives non-fluctuating cleaning efficiency every minute of the day, collects and disposes of dust and fumes immediately.
3. CENTRI-MERGE operates at constant efficiency during many years of trouble-free service.
4. CENTRI-MERGE eliminates health or fire hazard in dust control by its automatic removal as sludge.
5. CENTRI-MERGE is always dependable, never requires a shutdown during working hours for cleaning or routine maintenance.
6. CENTRI-MERGE is engineered for minimum maintenance expense, is a compact, self-contained unit, constructed for flexibility of arrangement to suit plant requirements.

THE Last Word IN CENTRI-MERGE

Schmieg INDUSTRIES INC.
Engineers & Manufacturers
349 PIQUETTE AVENUE • DETROIT 2, MICHIGAN

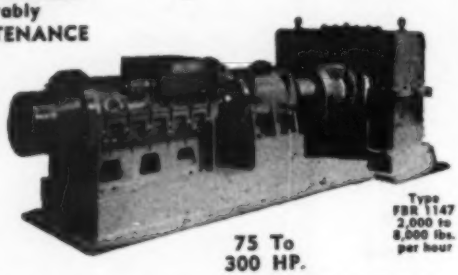
Continuous

WATSON

Unbelievably
LOW MAINTENANCE

MIXING
MASTICATING
PLASTICIZING
COMPOUNDING

MODELS
FROM
2,000 To
24,000
lbs. per hour



Type
FBR 1147
2,000 to
8,000 lbs.
per hour

75 To
300 HP.

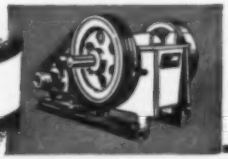
The modern method of handling heavy, viscous or solid materials of any type. Engineered for long, uninterrupted service. Positive drive feeding device eliminates bridging, clogging. Jacketed for either heating or cooling. All wearing parts hard surfaced, readily accessible. Send for Bulletin.

Our Laboratory Is At Your Service to help solve problems of mixing, masticating, plasticizing, compounding. Experimental or laboratory machine available for this work.

THE WATSON MACHINE CO. *Established 1845*
PATERSON 3, NEW JERSEY, U. S. A.

MASSCO Laboratory Crushers & Pulverizers

LABORATORY JAW CRUSHER

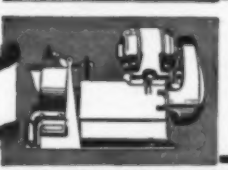


Double acting jaw delivers two blows per revolution, speeds crushing. Forward and downward motion increases capacity over conventional stroke, particularly on moist materials. Hand wheel replaces usual wrench or shims for jaw opening adjustment. Discharge openings ¼" to 1½" available. Easy to use, compact and relatively light weight welded steel construction.

GY-ROLL REDUCTION CRUSHER

Reduces ½" feed to as fine as 10 Mesh in a single pass. Very high capacity and low power consumption; replaces ballpy, unhandy equipment such as rolls and coffee mill. Two sizes available, 6" and 10".

LABORATORY PULVERIZER



The Massco-McCool is a disc-type grinder designed for pulverizing to fine meshes in one operation. Planetary movement assures long grinding surface life. No gears—reduces power; 100% anti-friction grease lubricated bearings; grinds more samples per hour at lower cost.

WRITE FOR SPECIFICATIONS AND PRICES

THE Mine & Smelter SUPPLY COMPANY

1442 17th St. Denver 2, Colo.—Offices in Salt Lake City, El Paso, 1775 Broadway, N.Y.C.

educating the non-scientist and explaining to him the technology of our times. The author covers the field rather thoroughly, from heavy chemicals to pharmaceuticals, insecticides, dyestuffs, fibers and even a short review on nuclear chemistry. The book is well illustrated, with emphasis on German corporations such as Basf, Hoechst, Berberg, etc.

It is difficult to see how it would appeal to an American audience unless the reader is particularly interested in the history of the I.G. and its fate after World War II.

Structure Data

CRYSTAL STRUCTURES, VOL. II and SUPPLEMENT TO VOL. I. By Ralph W. G. Wyckoff, Interscience Publishers, New York, $10 and $4.

Reviewed by Joseph S. Lukesh

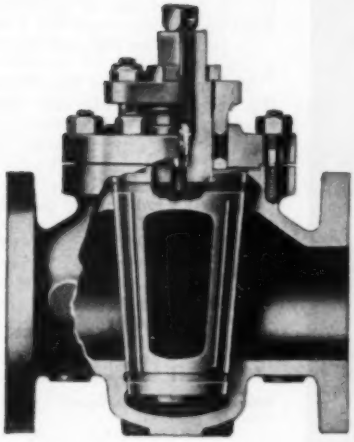
The magnitude of the task undertaken by Dr. Wyckoff in the preparation of "Crystal Structures" can be seen from the fact that the original plan to publish it as a single loose-leaf volume of three sections has been abandoned. Instead, because of the large growth of interest in structural crystallography in the last decade and the resulting increase in published information, it has become necessary to expand each section into a separate volume.

For the benefit of those who are not familiar with the first volume, published in 1948, here is a brief description of these volumes. The books are loose-leaf. This format was adopted to permit the insertion of pages of supplementary data in their proper place rather than in supplementary bound volumes. The subject matter is arranged by structure type, a chapter being devoted to each. Thus elements, compounds of the type RX, RX_2, R_mX_n, etc. are grouped separately. Each chapter is divided into four parts: text, tables, illustrations and bibliography. In the text the characteristics of various types of structures are described and individual elements and compounds discussed. All compounds are listed in the tables with pertinent information and individual structures are pictured in the illustrations. The bibliography is extensive.

Vol. II covers compounds of the following types: $R_n(MX_4)_m$, $R_n(MX_6)_m$, ammoniates, hydrates as well as aliphatic organic compounds, with the same thorough treatment as in the earlier volume. Since this book is a compilation of the results of other

(Continued)

WALWORTH
Lubricated
Plug Valves



for TOUGH assignments

where tight shut-off...
and easy operation
are "MUSTS"

Walworth Lubricated Plug Valves Offer These Advantages

- Complete surrounding of ports with resistant lubricant affords positive seal against leakage.
- Lubricant grooving system assures ease of operation — tight shut-off — greater protection against corrosion.
- Body and plug fully protected by lubricant from attack by line fluids.
- Quarter turn opens or closes valve.
- Made in a complete range of sizes ½" to 26" and for pressures from 175 to 5,000 psi., and for vacuum requirements.

For handling petroleum products, natural or manufactured gas, acids, alkalies, solvents, slimes, slurries . . . in fact for almost any hard-to-handle liquids—there's a Walworth Lubricated Plug Valve designed for the job.

Easy to operate, tight sealing, resistant to wear and corrosion, Walworth Lubricated Plug Valves assure long years of dependable service at low operating cost.

Walworth Lubricated Plug Valves are available in sizes ½" to 26" for pressures from 175 to 5,000 psi., and for vacuum requirements. For full details—prices, sizes, dimensions, and other pertinent data, see your Walworth distributor or write to:

WALWORTH

valves • fittings • pipe wrenches

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

"SOME POINTS to sleep on"
...regarding HARRISBURG Seamless Steel Cylinders for High-Pressure Gases
√ Made by America's gas cylinder pioneer
√ Backed by 78 years' manufacturing experience
√ Seamless... of special analysis steel
√ Fabricated on specially designed equipment
√ Maximum uniformity of side wall thickness
√ Made to I.C.C. Specifications
√ Approved by Bureau of Explosives
√ Available in domestic and export types
√ Safe, durable, and precision-built
√ Complete range of sizes, capacities, types
√ Any quantity deliverable... anywhere
Write for catalog and prices
HARRISBURG STEEL CORPORATION
Custom-Built Quality Products in Quantity
98 YEARS IN PENNSYLVANIA'S CAPITAL
Harrisburg 16, Pennsylvania

workers' research, the author is not, of course, responsible for factual errors. He has, however, attempted to criticize results which he feels may need revision. It is difficult to comment on typographical errors in a volume containing so much tabulated data. However, in the opinion of the reviewer, based on experience with Vol. I, there is no question but that such errors are at a minimum.

The supplement to Vol. I brings the information contained therein complete to 1949 with additional references to work done in earlier years. Included in the supplement are a new title page and a new index.

With the forthcoming publication of Vol. III and future supplements, Wyckoff's "Crystal Structures" will be the standard reference book of crystal structure data and, as such, is indispensable to scientists and engineers interested in the study of the solid state.

Importantly Abstract

THERMODYNAMICS OF IRREVERSIBLE PROCESSES. By S. R. de Groot. Interscience Publishers, New York. 242 pages. $4.

Reviewed by G. F. Kinney

This important new monograph in English by Professor de Groot appears while he is in this country as visiting research professor at the University of Maryland. The irreversible processes of the title are essentially the cross effects associated with two or more simpler transport phenomena, such as diffusion or heat conduction. Such cross effects are involved, for example, in the relation between thermoelectric power and the Peltier effect. Other examples include the production of EMF by a concentration gradient (concentration cell) and its inverse, the concentration changes (transference) accompanying applied EMF. Many of the simpler transport phenomena have been adequately treated individually by use of a pertinent relation such as the Boltzman equation, but here for the first time is a comprehensive theoretical treatment of many various effects and their interactions.

The basic idea is that a transport process, though macroscopically irreversible, is reversible on a microscopic scale. Taking a very simple example, the thermal agitation of a molecule at given temperature is exactly the same, statistically, in an aged system as in one where active heat conduction exists. Any readjustment

occurs simply because stable equilibrium represents the most probable distribution of molecules. Thus complex interferences between various transport processes do not arise, and cross-coefficients become identical when more than one driving potential is involved. This concept was first clearly stated by Onsager in 1931, but was actually used by Thomson in 1854 in his analysis of thermoelectricity. The Onsager theorem forms a basis for much of the present monograph. A proper formulation of driving potentials and fluxes is required, but some choice does exist. Thus the driving force for heat conduction may become $(-\text{grad } T)/T^2$, rather than the more usual form required by Fourier's law.

There are eleven chapters in the volume. The fundamental theory is first developed. Then there is a treatment of simpler transport phenomena such as heat conduction, electrical conduction, or relaxation phenomena. This is followed by a treatment of more complex items such as the thermomolecular pressure effect, the Dufour effect, and a study of liquid helium II. The work is highly abstract, largely mathematical, and couched in the language of the mathematical physicist. The chapter titled "Chemistry," for example, contains eight articles in 32 pages and uses 210 equations, most of them of statistical mechanical nature utilizing the vector notation. No numerical material or examples are provided.

Flask-Scratching

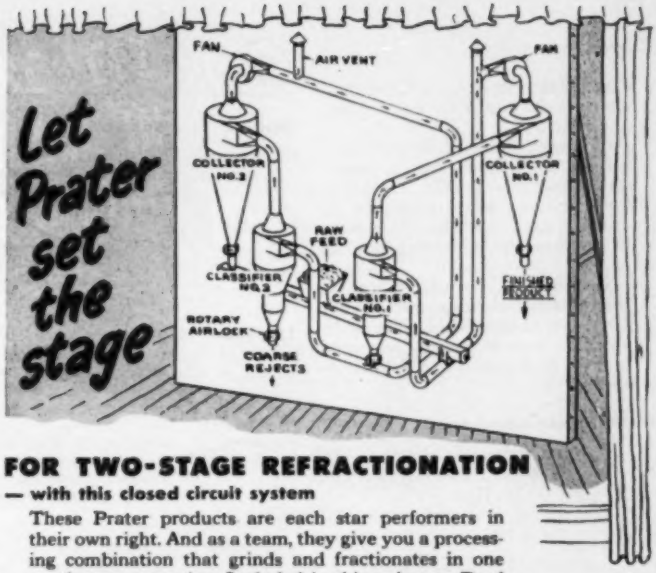
CRYSTAL GROWTH. By H. E. Buckley. John Wiley & Sons, New York. 571 pages. $9.

Reviewed by Robert L. Clarke

For anyone seriously concerned with the crystallization of substances, "Crystal Growth" offers a wealth of fundamental information. It is an ambitious work covering both theory and practice and is well executed with a satisfactory balance between the two phases. Thus the chemist with his daily crystallization procedures as well as the macrocrystal grower with his critical techniques will be benefited. The historical approach is used.

The Table of Contents: Solution and Solubility; Solubility and Supersolubility. The Artificial Preparation of Crystals. The Curie Theory of Crystal Growth. The So-Called Velocities of Growth. The "Diffusion" Theories. Recent Theories of Crystal Growth. Ideal and Real Crystals. Miscellaneous Types of Crystallization. Dissolution Phenomena. Crystal Habit Modification by Impurities. Relation-

(Continued)



FOR TWO-STAGE REFRACTIONATION

— with this closed circuit system

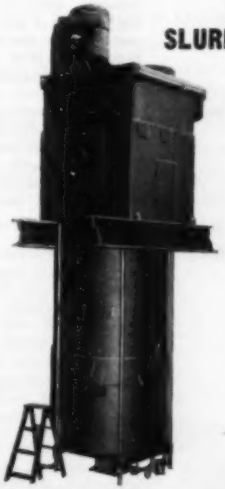
These Prater products are each star performers in their own right. And as a team, they give you a processing combination that grinds and fractionates in one continuous operation. Included in this unit are: Dual Screen Pulverizer (not shown) . . . Twin Cone Fractionators . . . Heavy Duty Collectors . . . and Rotary Airlocks. Write for details.

PRATER PULVERIZER COMPANY
1517 So. 55th Court, Chicago 50, Ill.

PRATER

J-C ZENITH PULP PRESSES

100% AUTOMATIC FROM SLURRY SUPPLY TO PRESSED CAKE



J-C Zenith Pulp Presses are becoming increasingly important to industry. Here are just a few of the many successful applications:

PAPER PULP: ultra high density bleaching—de-inking—concentrated black liquor recovery

CANNERIES: Juice extractions from pulp—de-watering for by-product recovery

VISCOSE: optimum press ratios in continuously pressing alkali from cellulose

CORN STARCH PLANTS: dewatering germ and fiber

FISH REDUCTION PLANTS: presses cooked whole or waste fish products—maximum water removal and oil recovery

RECLAIMED RUBBER: drier product (15 to 18% moisture), higher quality rubber obtained

GLUE PLANTS: maximum grease recovery and drier final product

Step up profits through improved pressing efficiency. For applications to individual problems, for performance data, write Dept. CE

A PRODUCT OF
JACKSON & CHURCH COMPANY, SAGINAW, MICHIGAN
"Work well done since '81"

ship of Substances During Crystallization. Peculiarities of Crystal Growth. Appendix.

Of interest to the "flask scratchers" will be illustrations that powdered glass sometimes inhibits crystallization. Rubbing serves principally to combine nuclei and thus make them larger than the supersolubility size range.

Dr. Buckley is senior lecturer in the crystallography department at the University of Manchester. Having devoted 25 years to research on crystal growth, he was well qualified to undertake this work.

Two Unreached Goals

STRUCTURAL CHEMISTRY OF INORGANIC COMPOUNDS. Vol. I. By W. Hückel. Elsevier Publishing Co. New York. 437 pages. $9.

Reviewed by F. C. Nachod

Dr. L. H. Long has translated Professor Hückel's Anorganische Strukturchemie. The present volume comprises book I, entitled stoichiometry and systematization, and book II, atomic structure and chemical bonding, while book III, structure and constitution will form the subject matter of Vol. II.

The objects of this text are to give an account of our present knowledge of inorganic chemistry and to afford it the systematization that its sister doctrine organic chemistry has enjoyed for many years. Neither of the two goals has been achieved even remotely. In the first aim, Dr. Hückel has been handicapped by lack of access to some of the original literature references and he thus pleads in the foreword for aid. This shortcoming while perhaps not excusable is at least understandable. However when it comes to the second—namely systematization—the reader is left in a feeling of confusion and diffuseness. One wonders what the author has in mind and who makes the audience he is addressing. There is a further lack of integration between books I and II and while it is conceded that much useful information can be found between the two covers of Vol. I, the extraction of it requires at least some mental dentistry.

The present volume can only be recommended with considerable reservations to the mature chemist and certainly not to the student or the less enlightened worker who wishes to learn about systematization in inorganic chemistry. *(End)*

Recent Books & Pamphlets

Subject	Summary	How to Order
Sublimation	An analysis of principles of a little known unit operation. Discussion of conditions under which a sublimation process will prove successful. Most of the theory presented in the report was developed by the author to supply information he needed but which did not previously exist. 10 pages.	Reprint No. 181. By Melvin Nord. Editorial Dept., *Chemical Engineering*, 330 West 42nd St., New York 18, N. Y. 25 cents.
Limestone	Location, size and quality of deposits in the area served by the B. & O. Railroad. Liberal use of maps. Includes an 8-page appendix on uses. 105 pages.	"High-Calcium Limestones." Baltimore and Ohio Railroad Baltimore 1, Md.
Styrene	Preparation, purification, care and handling, physical and thermodynamic properties, chemical properties, polymerization. 126 pages.	"Styrene." By A. L. Ward and W. J. Roberts. Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y. $3.50.
Chemicals	Listings with complete references and abstracts of recent German patent applications and research reports, translated to English, concerning production of inorganic chemicals. 11 pages.	"Inorganic Chemicals." Bulletin C 55, Research Information Service, 509 Fifth Ave., New York 17, N. Y. Gratis.
Synthetic Fibers	Chart listing all synthetic fibers commercially available in 1951. Included for the first time are dynel, Dacron, Acrilan, and staple saran.	*Textile World*, 330 West 42nd St., New York 18, N. Y.
Safety	Nine papers mostly concerned with chemical engineering methods for combating certain industrial health hazards. Subjects covered include the problem of sulphur dioxide from power plant stacks, Orlon acrylic fiber in cloth dust collection, radiant heat demonstration. 50 pages.	"Chemical-Engineering Conferences, 15th Annual Meeting." Transactions Bulletin 18, Industrial Hygiene Foundation, Mellon Institute, 4400 Fifth Ave., Pittsburgh 13, Pa. Gratis.
Job Counsel	Complete reports on 433 occupations by which Americans earn their living. Descriptions of the jobs themselves, future prospects, information on training and required qualifications, earnings and working conditions. 575 pages.	"Occupational Outlook Handbook." Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. $3.
Acetylene	Two reviews of the German work and its relation to acetylene chemistry. One is a critical summary of a large number of BIOS, CIOS and FIAT reports and was written as an attempt to assess the position of acetylene in the German chemical economy and in particular the status of the newer work associated with the name of Reppe. The second covers the more speculative and preliminary work which by the end of the war had not reached the production stage. 158 pages.	"The Acetylene Industry and Acetylene Chemistry in Germany during the period 1939–1945." His Majesty's Stationery Office, York House, Kingsway, London, W. C. 2, England. 3s. 6d.
Flowmeters	Standards for over-all dimensions, general arrangement and location of connections, minimum sealing volume required by conventional meters. Drawings show three acceptable methods of fabrication. 8 pages.	"Flowmeter Installations, Seal and Condensate Chambers." Instrument Society of America, 921 Ridge Ave., Pittsburgh 12, Pa. 50 cents.

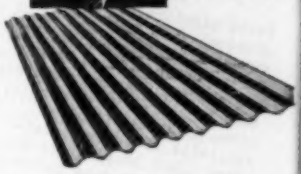
(Continued)

120,000 SQUARE FEET OF THE TOP VALUE IN ROOFING AND SIDING

Applicator: M. W. Nabakowski, vice-president of the A. Nabakowski Co.

The Thatcher Glass Company plant at Lawrenceburg, Indiana, called for 120,000 sq. ft. of roofing and siding. The owners and their architects, Herman and Associates, Cincinnati, liked the idea of aluminum. They knew its lighter weight (56 lbs. per square) would save on framing. They knew this rustproof, corrosion-resistant metal would need no painting—practically eliminate maintenance. And aluminum's heat reflectivity would make the buildings cooler in summer, warmer in winter.

M. W. Nabakowski, Amherst, Ohio, roofing and siding applicator, has this to say: "Reynolds Industrial Corrugated is an ideal material because the finished job has eye-appeal, workmen like to handle it, and application costs are easily controlled." But the best testimonial will be written through the years, in superior performance and maintenance economy. It's the top value you want in your next construction. Call on Reynolds for literature, technical assistance and application details.



Specifications for Reynolds *Lifetime* Aluminum Industrial Corrugated:

Thickness .032"
Corrugations 7/8" deep, 2-2/3" crown to crown
Uniform load support (roof) 80 p.s.f. on 4' purlin spacing
Uniform wind load capacity (siding) 20 p.s.f. on girt spacings up to 7'9"
Roofing width 35", coverage 32"
Siding width 33-3/4", coverage 32"
Lengths 5', 6', 7', 8', 9', 10', 11', 12'

Offices in principal cities. Check your classified phone book for our listing under "Building Materials," or write: Reynolds Metals Company, Building Products Division, 2005 South Ninth Street, Louisville 1, Ky.

Aluminum is required for planes and other military needs. Reynolds *Lifetime* Aluminum Industrial Corrugated is still produced, but the total supply is necessarily reduced. Rated orders receive priority handling.

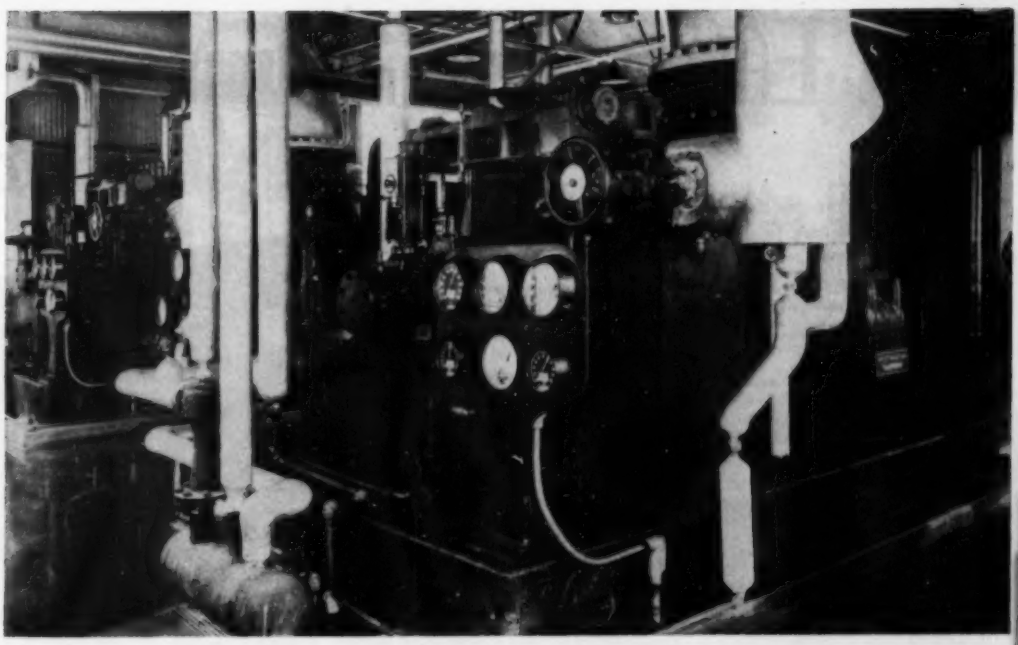
REYNOLDS *Lifetime* ALUMINUM INDUSTRIAL CORRUGATED

Inter-plant
MEMO
Specify
mpc
SARAN RUBBER
lined steel PIPE
For MAXIMUM
RESISTANCE TO
CORROSIVE
LIQUIDS & GASES
Solve pipeline corrosion problems with Michigan Saran rubber-lined steel pipe. Saran rubber linings offer the highest degree of resistance to corrosive chemicals, oils, acids and solvents. Available in either fabricated light gauge steel or standard steel pipe in 10' and 20' standard lengths ranging in size from 8" up... or fabricated to your exact requirements.
For additional information on Saran rubber-lined steel pipe and fabricated or standard cast iron flanged fittings...write today to your nearest "mpc" representative or to our application engineering department.
"a development of The Dow Chemical Company
mpc
THE MICHIGAN PIPE COMPANY
BAY CITY, MICHIGAN

RECENT BOOKS & PAMPHLETS, cont. . .

Subject	Summary	How to Order
Hydrocarbons	Translation of a report of the Imperial Fuel Research Institute of Japan, July 1935, on research on the production of synthetic liquid fuels from coal.	"Synthesis of Hydrocarbons," by S. Tautsumi. I.C. 7594, Bureau of Mines, Washington 25, D.C. Gratis.
Security	A detailed manual describing exact procedures required in handling all sorts of classified information.	"Industrial Security Manual for Safeguarding Classified Matter." Munitions Board, Washington 25, D.C.
Pollution	State-Federal report on the current situation. How the river's water is being used and misused. What pollution control measures are in effect and what more must be done. Five fold-out maps help clarify the picture. 122 pages.	"Tennessee River Drainage Basin." Public Health Service Publication No. 69. Superintendent of Documents, Washington 25, D. C.
Defense Business	How to be placed on government bid lists; methods of financing plant construction; how to appeal for "hardship relief" from controls and regulations; means of getting help in obtaining needed machinery and operating supplies.	"Mobilization Guide for Small Business." Available at all field offices of Department of Commerce.
Controls	Outline of the principles and procedures of the Controlled Materials Plan.	"ABC's of CMP." Available at all field offices of Department of Commerce.
Safety	How to minimize the explosion hazards of a wide variety of combustible materials. Limits of flammability and ignition temperatures.	"Gas Explosions and Their Prevention." By G. S. Scott et al. IC 7601, Bureau of Mines, Washington 25, D. C.
Natural Gas	Appraisal of the problems of certain specific areas.	"Possible Effect of the Expanding Use of Natural Gas on the Production of Coke and Coal Chemicals in the U. S." By J. DeCarlo and J. Corgan. IC/ 7579, Bureau of Mines, Washington 25, D. C.
Production	Official weekly bulletin of the defense production program. Initiated at the beginning of May 1951.	"Defense Production Record." $2.50 per year. Superintendent of Documents, Washington 25, D. C.
Gaseous Fuels	Procedures for sampling and measurement, testing and analysis. Necessary equipment is fully illustrated and described. 138 pages.	"Standards on Gaseous Fuels." Second edition. American Society for Testing Materials, 1916 Race St., Philadelphia. $1.75.
Fittings	Standards covering over-all dimensions, tolerances, and marking for wrought and cast carbon- and alloy-steel welding fittings. 14 pages.	"Steel Butt-Welding Fittings." American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y. 75 cents.
Explosives	Summary of fundamental research and technical studies conducted by the Explosives and Physical Sciences Division. Mimeographed.	"Report of Research and Technologic Work on Explosives, Explosions, and Flames, 1950." By B. Lewis. RI 4793 Bureau of Mines, Washington 25, D. C.
Sesame Oil	Report on the first systematic processing and utilization research on sesame oil. Ten papers of special value to oilseed processors in the Cotton Belt where the crop may be grown on a large scale as a supplement or alternate raw material for cottonseed.	Southern Regional Research Laboratory, 2100 Robert E. Lee Blvd., New Orleans 19, La. Gratis.

—*End*



Three Jobs for Steam—all powered by Worthington

They get a lot of work out of steam at Burnell-North Pettus Cycling plant near Pettus, Texas, operated by Stanolind Oil and Gas Company.

The Worthington turbine generator shown above is one of two providing electric power for general plant service. The steam turbines are 1,500 kw units, operating at 600 lb. gauge, 725 Ftt, and exhausting to 27 in. vacuum. The generators operate at three phase, 60 cycles, 70% power factor and are equipped with top-mounted air coolers.

There are also *nine* Worthington mechanical-drive turbines at this plant. Seven of these drive centrifugal pumps, and two drive induced-draft fans.

So – three jobs in all: electricity, pumps, fans.

This reliance on Worthington steam turbines is duplicated throughout the petroleum industry. Whether you want turbine-generator sets up to 10,000 kw or mechanical-drive turbines, Worthington has the correct type and size, with the petroleum industry's stamp of approval. A broad line of power plant equipment, giving you *unit responsibility*, and our unmatched experience in power plant applications are further reasons for doing business with Worthington.

Get the *savings* that steam offers—get *more work* out of steam. *There's more worth in Worthington.* For bulletins, write Worthington Pump and Machinery Corporation, Steam Turbine Division, Wellsville, N.Y.

WORTHINGTON

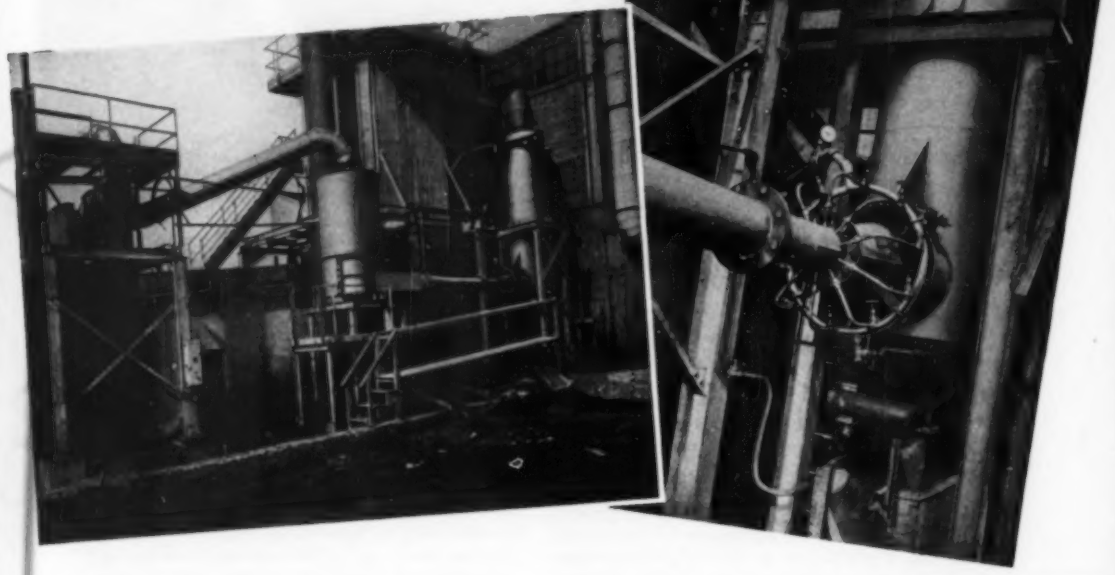
STEAM TURBINES

T.1.2

A GREAT TEAM IN STEAM

Here's Efficient **DUST** and **FUME** Removal

Recently installed at the Philadelphia plant of the Electric Storage Battery Co., this Pease-Anthony Venturi Scrubber is effectively reducing fine dust emissions from a secondary lead smelter. The dust composed largely of sub-micron particles is removed from the furnace gases.



Other Typical Applications

Chemico P-A Venturi Scrubbers are now being used in a wide range of industries for the highly efficient removal of micron and sub-micron dusts and fumes. For a detailed analysis of your scrubbing problem, write or call our P-A Sales Department.

APPLICATION	MATERIALS BEING REMOVED	DUST AND FUME LOADINGS Inlet to Scrubber	Outlet from Scrubber
DUSTS			
Diatomaceous Earth Plant	Diatomaceous Earth	1.2 grains/scf	0.05 grains/scf
Rubber Blenders	Carbon Black	0.3 grains/scf	0.003 grains/scf
Yellow Brass Foundry Furnace	Zinc Oxide	3.5-10 grains/scf	0.7 grains/scf
Lime Kilns	Lime and Na_2O Fumes	7.0 grains/scf	0.02 grains/scf
Electric Furnace Fumes	Iron Oxide	0.2 grains/scf	0.03 grains/scf
Blast Furnace	Iron Oxide	4.0-20.0 grains/scf	0.008-0.08 grains/scf
Secondary Lead Blast Furnace	Lead and Rubber Compounds	1-10 grains/scf	0.05-0.20 grains/scf
FUMES			
Copperas Roasting Plant	H_2SO_4 Mist	100-300 Mg/scf	1-5 Mg/scf
Titanium Plant	H_2SO_4 Mist	120 Mg/scf	2.0 Mg/scf
Phosphoric Acid Plant	H_3PO_4 Mist	100-300 Mg/scf	3.0 Mg/scf
Wood Distillation	Tar Fog and Acetic Acid Mist	1000 Mg/scf	10-40 Mg/scf
Enamel Smelting Furnace	Dust and Fluoride Fumes	55.0 Mg/scf	4.0 Mg/scf
Dry Ice Plant	Amine Fog	25.0 Mg/scf	5.0 Mg/scf

CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

488 MADISON AVENUE, NEW YORK 22, N. Y.

CABLES: CHEMICONST, NEW YORK

EUROPEAN TECHNICAL REPRESENTATIVE

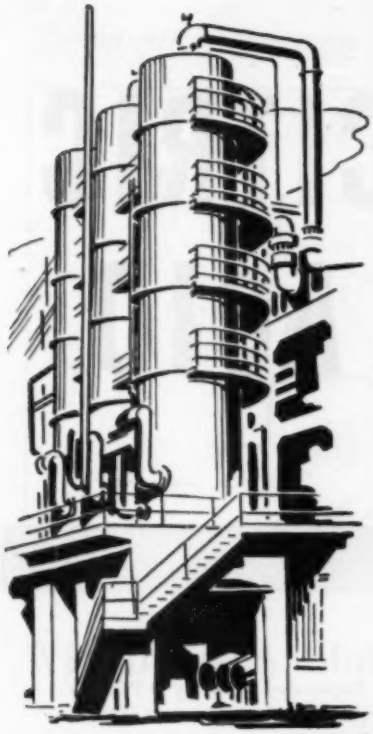
CYANAMID PRODUCTS, LTD., NORTH WEST WING, BUSH HOUSE

ALDWYCH, LONDON W.C. 2, ENGLAND

CHEMICO

Chemico plants are profitable investments

CC 554



554-12

How Process Plants

SAVE THREE WAYS with Ingersoll-Rand Turbo-Blowers

In the process industries, and wherever large volumes of air or gas must be compressed to moderate pressures, over 3,000,000 horsepower of Ingersoll-Rand Turbo-Blowers are repeatedly proving their economy and dependability.

They Save Power Costs with a highly efficient design that stays efficient year after year.

They Save Maintenance Costs because they are designed as rugged heavy-duty machines with an extra-large shaft, spherically-seated, 4-way shim adjusted bearings, full shaft sleeves . . . and many other features that mean less maintenance even under the most severe operating conditions.

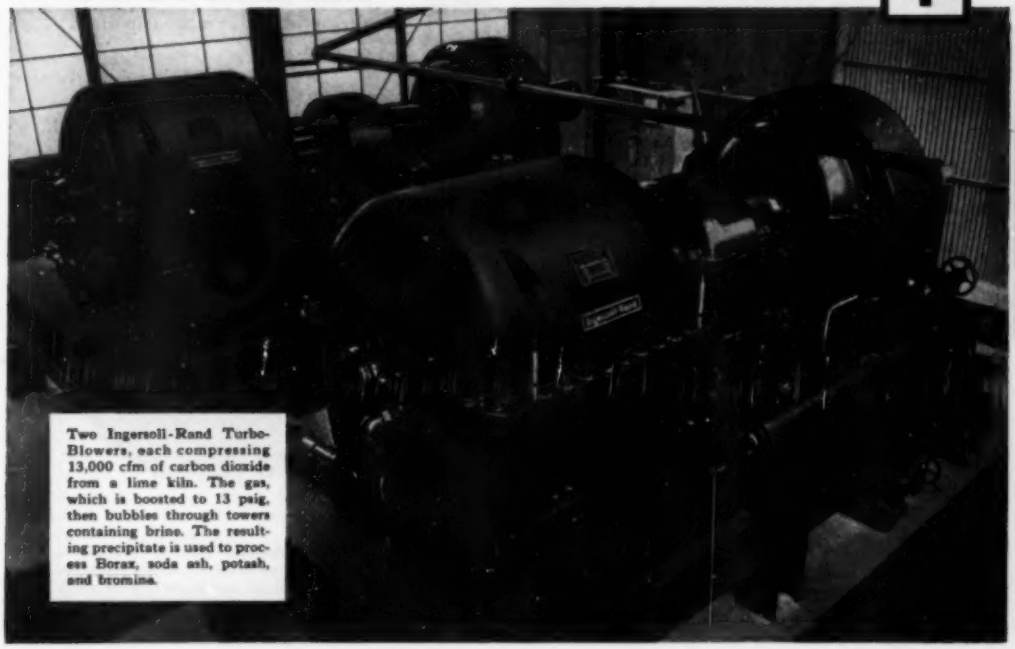
They Avoid Costly Interruptions that can shut down your entire plant. For example, one I-R 11,000 hp Turbo-Blower was opened for inspection after six war-time years of continuous service and it was in perfect condition. While we don't approve of neglecting periodic inspection, we are proud that the orginal low power consumption was not affected by use . . . that there was no costly maintenance . . . and that production was not interrupted.

Whatever your blower application, Ingersoll-Rand can design and supply the Turbo-Blower that's *right* for the job—a blower you can depend on for constant delivery of air or gas at the lowest possible cost. Sizes: to 21,000 hp, to 155,000 cfm, to 110 psig and higher.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO-BLOWERS
CONDENSERS • CENTRIFUGAL PUMPS • DIESEL & GAS ENGINES



Two Ingersoll-Rand Turbo-Blowers, each compressing 13,000 cfm of carbon dioxide from a lime kiln. The gas, which is boosted to 13 psig, then bubbles through towers containing brine. The resulting precipitate is used to process Borax, soda ash, potash, and bromine.

CITRIC ACID

Additional Supplies Now Available

- Citric Acid U.S.P.
- Citric Acid Anhydrous
- Sodium Citrate VIII Granular
- Sodium Citrate U.S.P.
- Sodium Citrate Anhydrous
- Ferric Citrate
- Ferric Ammonium Citrate U.S.P.
- Ferric Ammonium Citrate N.F.
- Ammonium Citrate Dibasic
- Potassium Citrate N. F.

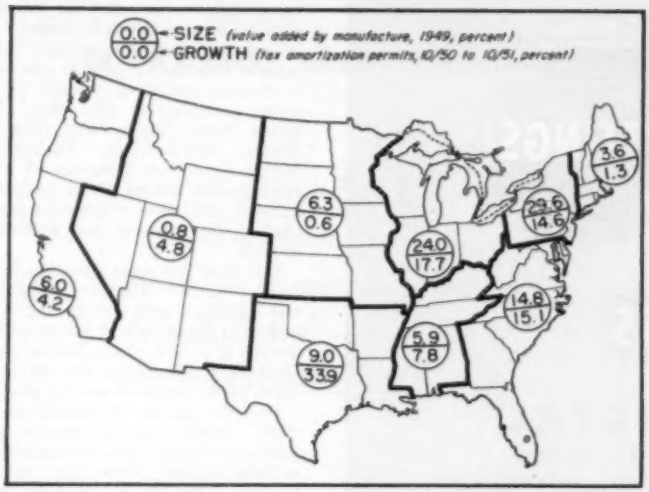
Expanded capacity at Pfizer's plant in Groton, Conn., has made possible increased production of citric acid and its many important derivatives.

Pfizer's recently enlarged citric acid plant at Groton, Conn.

PFIZER

Manufacturing Chemists for Over 100 Years

Write for technical data and prices to Chas. Pfizer & Co., Inc., 630 Flushing Ave., Brooklyn 6, N. Y., 425 North Michigan Ave., Chicago 11, Ill.; 605 Third St., San Francisco 7, Calif.



How fast plant write-offs have been apportioned for chemicals and allied products.

Will Industry Shift Its Plants?

"There is no known military defense against the atomic bomb itself except space."

Ever since President Truman announced on Sept. 23, 1949, that the Russians had set off an atomic explosion, the question of dispersal of industry was pushed to the fore.

Unfortunately, the public and a large section of industry have never been clear on what dispersion involves. One of the prime reasons for the confusion is that official interpretation of dispersion policy has so often varied.

Even before World War II the U. S. Army had urged that new defense plants be located "west of the Appalachians, considerably east of the Rockies, and from 200 to 500 miles inland from all northern and southern borders."

After the War, in 1948, the National Resources Board recommended that, wherever feasible, areas of industrial concentration be held to less than five square miles, or located in population centers of less than 50,000 separated by a minimum of ten miles of relatively open country.

As recently as last month, however, the President indicated that dispersion had been reduced to a very modest policy. "It merely encourages the spacing of new defense and defense-supporting industries a few miles apart." In other words, a firm can expand within any of the existing areas of industrial concentration just so long as it leaves some space between the new plant and existing facilities.

In order to spur some industry dispersion, the government has used several incentives. The most important program is the section of the Internal Revenue Code which permits accelerated tax amortization, granted through certificates of necessity. By refusing or granting industry requests to write off in a five-year period up to 100 percent of the cost of new capital equipment, the government has been in a position to influence business leaders regarding their choice of plant sites. This program—which has been temporarily suspended for 60 days—may eventually apply to at least $10 to $13 billion of facility expansion.

Other—though less important—avenues by which the government can influence the location of industry include the Department of Defense program of military contracts and the programs for guaranteed loans and for loans to industry provided under the Defense Production Act.

Though dispersion policy has been progressively modified it has not caught up with the facts of economic and military life. With atomic planes, submarines and artillery in the prototype stage, the futility of maintaining any sort of "privileged industrial sanctuary" becomes increasingly apparent.

An analysis of national industrial sites leads to the conclusion that a great deal remains to be done if this country is to achieve an adequately decentralized industrial pattern.

The 1949 Department of Commerce figures on Value Added by Manufacture give as good an indication of the existing distribution of industrial capacity as can be found. A glance at these figures tabulated on a regional basis provided some rather startling information. More than 39 percent of all industry is concentrated in four states, 47 percent in five states, and over 52 percent is located within the six states of New York, Pennsylvania, Illinois, Ohio, Michigan and New Jersey. If California is included, the total jumps from 52 to over 58 percent. Six of these states—Illinois is the exception—are border states.

When the $6.2 billion of amortization permits granted as of July 16 is analyzed on a regional basis, the seven leading states in terms of the value of permits are Pennsylvania, Texas, Ohio, Michigan, Connecticut, California and Illinois. These seven states account for 60 percent of the value of total write-off permits. The only difference in the listing of the big seven is that Texas and Connecticut have replaced New York and New Jersey.

If business plants were to be concentrated in the area that military leaders considered the most secure, the ten leading industrial states would be Wyoming, Utah, Colorado, South Dakota, Nebraska, Kansas, Oklahoma, Arkansas, Missouri, and Iowa. As matters stand now, these states—still using the Value Added by Manufacture standard—have 5.6 percent of total industry. They received 5.8 percent of the value of amortization permits. Obviously, the government has not made much progress on dispersion as far as this particular area is concerned.

When we look at the location of chemical and allied products plants, the six leading states—New Jersey, New York, Illinois, Texas, Pennsylvania and Ohio—are seen to have 49 percent of total production. If the

(Continued)

FOR YOUR
STAINLESS
STEEL
FITTINGS
AND FASTENERS
IT'S ALLMETAL
FOR QUALITY
AND DELIVERY
Allmetal's fasteners and fittings are stocked in types 304 and 316.
Specials to order. All made right by Allmetal.

ALLMETAL, Specialists in Stainless, Produce
Stainless Products Exclusively.

WRITE FOR
CATALOG A

MANUFACTURERS SINCE 1929
ALLMETAL
SCREW PRODUCTS COMPANY, INC.
33 GREENE STREET NEW YORK 13, N. Y.
STAINLESS STEEL FASTENERS

states of California, Virginia and Michigan—all border areas—are included, this total is upped to 63.4 percent. Whatever theory of dispersion one accepts, it is plain that the present situation leaves much to be desired.

From October 1950 to date the value of amortization permits granted to chemical and allied products producers amounted to more than $1 billion. The six leading states—Texas, Florida, Pennsylvania, Louisiana, Michigan and New York—are all located on the United States borders. Between them they reaped 56.3 percent of the value of fast write-off permits.

It is clear that some relocation has been achieved. Florida, Louisiana and Michigan rank among the six leaders in the matter of tax permits, whereas it is New Jersey, Illinois and Ohio which will fill out the top half dozen in the matter of existing plant.

Only 0.8 percent of chemical and allied products industrial capacity is located in the ten states of maximum military security. These same states received 7 percent of the value of total tax write-off permits for chemical expansion. However, if a $53 million plant to be built in Bauxite, Arkansas by the Aluminum Ore Co. is excluded, this figure fades away to less than 2 percent.

The facts are conclusive. Both U. S. industry generally and the chemical industry specifically fail to meet any of the generally accepted dispersal criteria. The concentration of industry is great—and in the area of least military security.

It would be foolish to think that industry can be neatly arrayed over the fact of the country.

But if the Russians are an aggressor nation bent on world conquest, and if they do have an atomic stockpile, and, finally, if the destructive power of the A-bomb is as great as our scientists and military leaders have proclaimed, then dispersal of plant and equipment may be necessary for the survival of the nation.

A really thorough dispersal is out of the question. The cost has been estimated by one expert at a "minimum of $100 billions." And the other extreme is the President's policy. That may reduce the toll that any one A-bomb can take, but it won't change the fact that half of national industrial capacity is located in a half dozen states.

Congress and the President have been wrestling with this problem for months, and much more work is still needed. It's clearly a top problem for business leaders, too. —*End*

Have you ever seen a flying 'dust' man?

...You will when a Buell Engineer shows you how to reclaim the values in escaping dust and attain top over-all efficiency

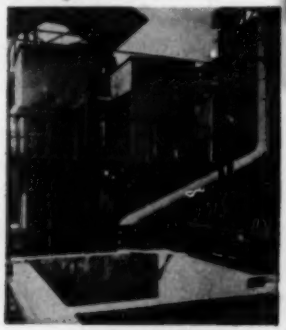
When we're called upon to boost efficiency and halt profit losses due to escaping dusts, Buell engineers plan with precision, yet move with surprising speed.

Quickly, they can pin-point a costly escape-dust problem...compute the actual loss in dollars as well as in efficiency...then, with a sureness that comes only by experience. they will design and build the dust recovery system that will most efficiently and economically do the job.

Here's why: Buell engineers—a highly skilled group of industrial "dust" men—are backed by more than 200 man-years of experience in the science of dust recovery. As a result, industry looks to Buell for leadership in methods and equipment that mean more recovered dust at less cost—for you!

For full information write today. Ask for the new, informative 'Dust Recovery' bulletin. Buell Engineering Company, Dept. 12-J, 70 Pine Street, New York 5, N. Y.

'SF' Electric Precipitator for collecting acid mist.



ELECTRIC CYCLONIC

HIGH-EFFICIENCY CYCLONES • ELECTRIC PRECIPITATORS
TYPE 'LR' COLLECTORS • LOW DRAFT LOSS COLLECTORS
SPECIAL PURPOSE COLLECTORS • DUST HOPPER VALVES

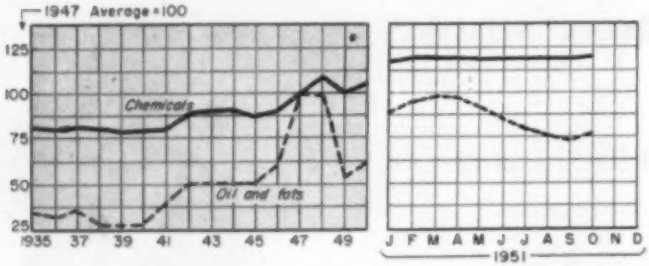
buell

C. E. ROSENBERG A. R. P. E.

ENGINEERED EFFICIENCY IN DUST RECOVERY

Process Industry Trends

PRICES

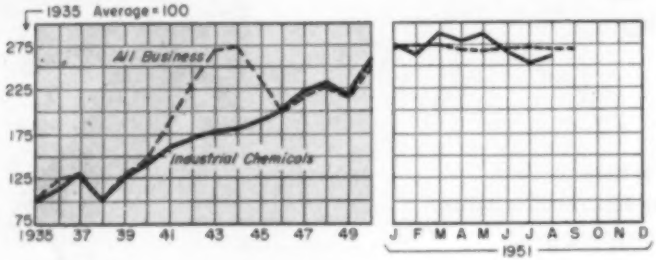


Chemical Engineering's Price Indexes

Chemicals — Up 0.19
Fats & Oils — Up 1.02

	Chemicals	Oils & Fats
As of Oct. 1	119.43	75.31
Last month	119.26	74.29
October 1950	111.99	71.01
October 1949	100.42	48.97

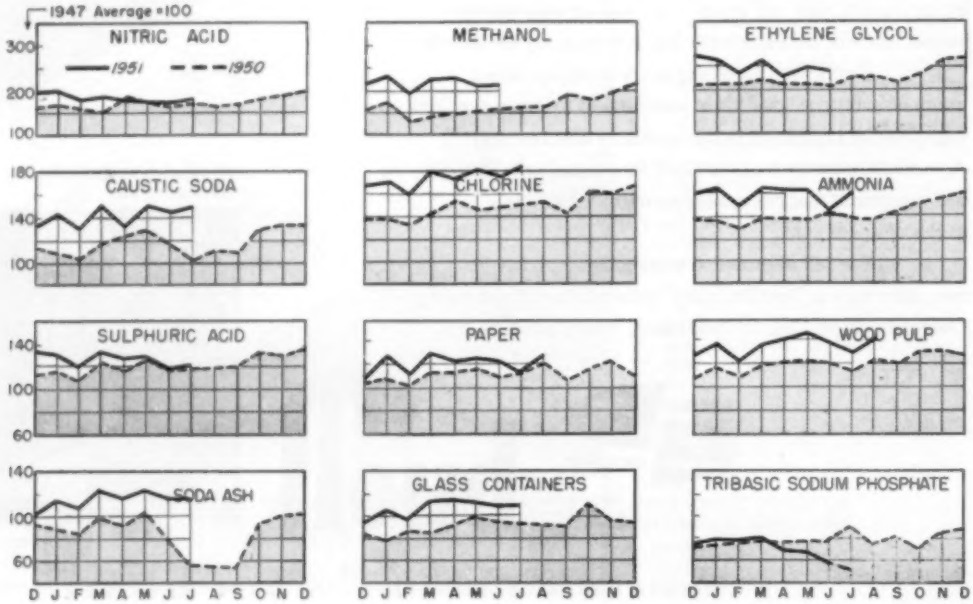
CONSUMPTION



Industrial Chemicals Index

	Aug. (Est.)	July (Prelim.)	June (Revised)
INDEX	262.15	252.80	266.57
Fertilizers		40.20	52.41
Pulp and paper		27.89	30.13
Petroleum refining		26.15	25.66
Iron and steel		15.92	15.87
Rayon		32.90	31.76
Glass		22.21	21.83
Paint and varnish		25.88	28.96
Textiles		9.85	11.84
Coal products		11.04	11.19
Leather		3.58	3.90
Explosives		8.33	8.76
Rubber		5.83	6.56
Plastics		14.16	17.70

PRODUCTION



"MUST" Reading

for Plant Engineers

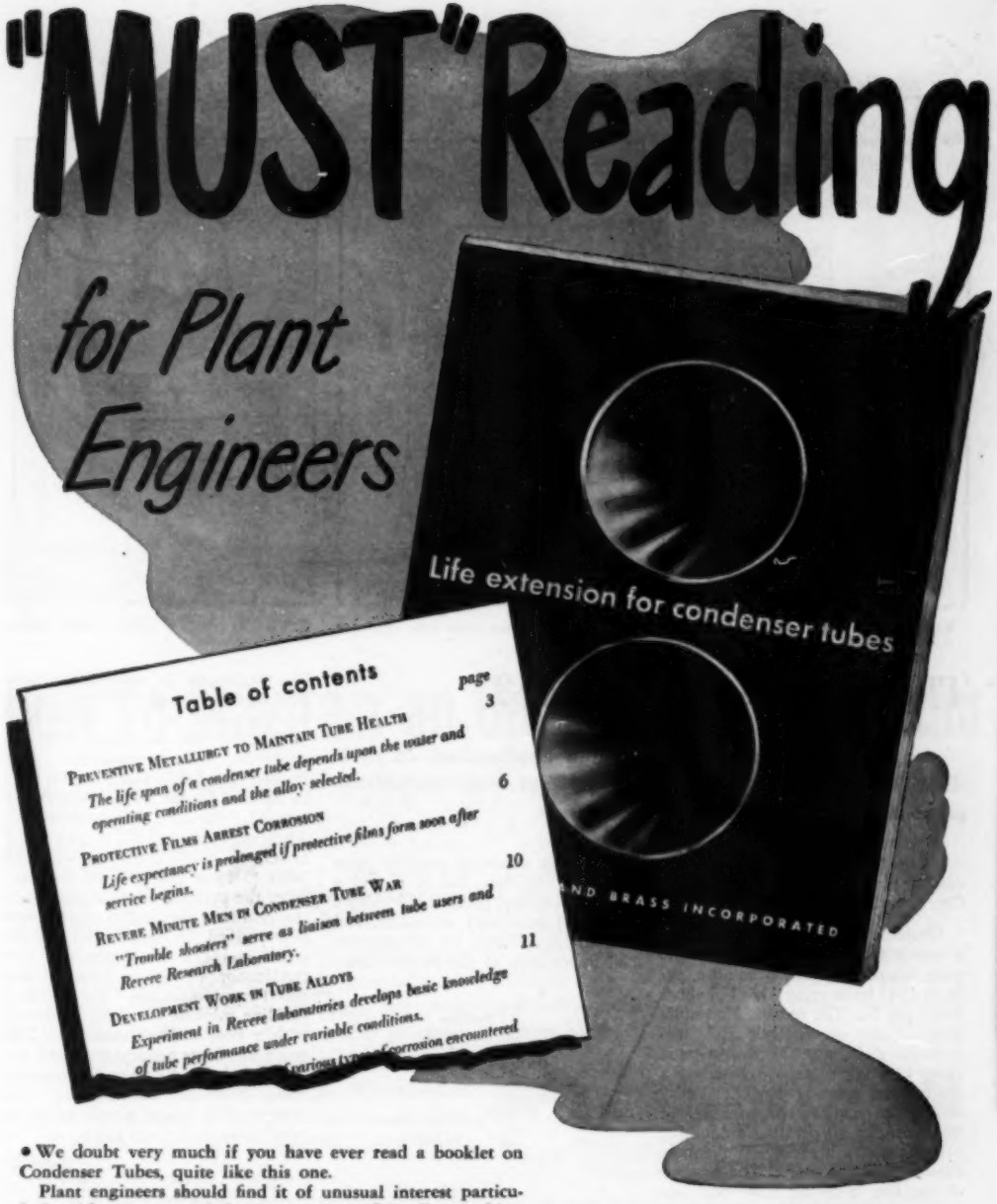


Table of contents page

PREVENTIVE METALLURGY TO MAINTAIN TUBE HEALTH 3
The life span of a condenser tube depends upon the water and operating conditions and the alloy selected.

PROTECTIVE FILMS ARREST CORROSION 6
Life expectancy is prolonged if protective films form soon after service begins.

REVERE MINUTE MEN IN CONDENSER TUBE WAR 10
"Trouble shooters" serve as liaison between tube users and Revere Research Laboratory.

DEVELOPMENT WORK IN TUBE ALLOYS 11
Experiment in Revere laboratories develops basic knowledge of tube performance under variable conditions.

Various types of corrosion encountered

• We doubt very much if you have ever read a booklet on Condenser Tubes, quite like this one.

Plant engineers should find it of unusual interest particularly with present restrictions on copper and its alloys making it more important than ever that every last ounce of use be squeezed out of the condenser tubes in their plants.

This 28-page booklet includes data on various copper alloys, photos of cut-away tube sections showing various types of corrosion encountered in condenser tube service and photomicrographs showing the grain structure of different kinds of metals under varying operating conditions.

Send for your copy today. Please make request on your firm's letterhead. Thank you. Address Department P.R., Revere Copper and Brass Incorporated, 230 Park Avenue, N. Y. 17, N. Y.

REVERE 150 Years of Service to America

COPPER AND BRASS INCORPORATED

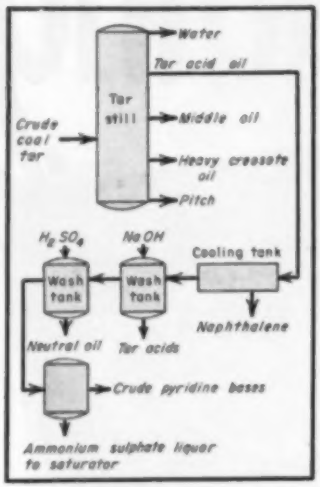
Founded by Paul Revere in 1801

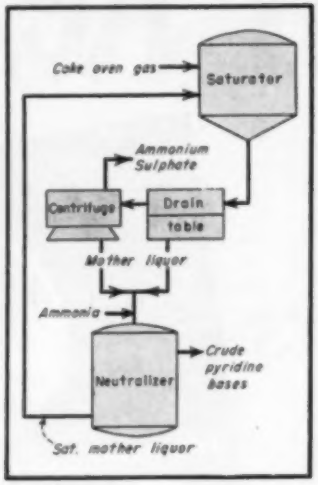
230 Park Avenue, New York 17, N. Y.

• •

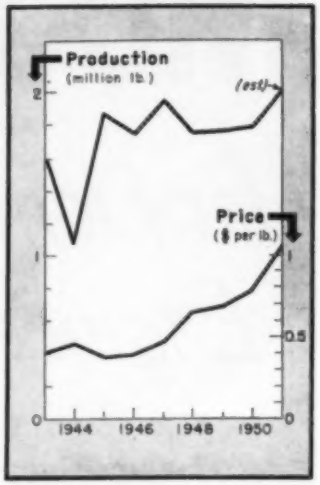
Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY





CRUDE pyridine may come from crude coal tar but most comes from coke oven gas.



REFINED pyridine output holds steady.

The Future of Pyridine?

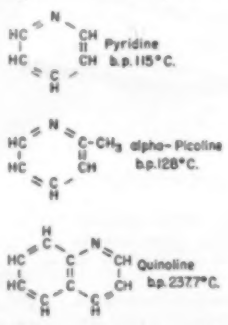
Pyridine market—due to new applications of pyridine—shows every sign of expanding, but scarcities will be great until synthetic manufacture comes.

CHARLES H. CARPENTER, JR., *senior market analyst, American Cyanamid Co., New York, N. Y.*

Demand today for pyridine is considerably greater than the supply. Its price has risen steadily from 40 c. per lb. in 1943 to its present level of about $1.05 per lb. The reason: New sulfa drugs, niacin or nicotinic acid, niacinamide and the antihistamines came along in quick succession to create a greater and greater demand. Today such pharmaceuticals take an estimated 40 percent of all pyridine produced.

Synthetic manufacture is the only answer to the shortage. The amount of pyridine available from coal carbonization is about at its peak. Several companies are searching for a synthetic process. Recently, Carbide and Carbon and Phillips Chemical have announced plans for the production of methylethylpyridine and Reilly Tar and Chemical has stated that they expect to be making sizable quantities of synthetic pyridine by 1953. Nepera Chemical Co. is already making 2-methyl, 5-ethyl pyridine.

There are numerous pyridine bases including: pyridine, and α, β, and γ picolines (methyl pyridine), lutidenes (dimethyl pyridines), quinoline, and isoquinoline. Three are of commercial importance at the present time.



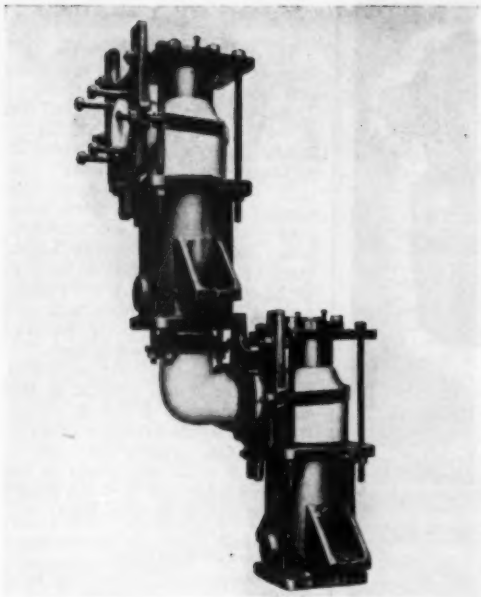
Pyridine bases are recovered in two different places in a coke plant: (1) from coal tar and (2) from the mother liquor drained from the ammonium sulphate.

Method of recovery from coal tar: The crude coal tar is fractionated in pipe stills to obtain a low boiling oil fraction called tar acid oil, or light carbolic oil. This fraction is cooled to crystallize out naphthalene. The drained oil is washed with caustic soda to remove the tar acids (phenol and cresols). The oil is then washed with dilute sulphuric acid (15 to 30 percent H_2SO_4. The acid combines with the bases to form the pyridine sulphate. After the pyridine sulphate solution is removed from the neutral oil, it is usually purified by rectification. Both direct and coil steam are used for rectification to remove traces of oils and tarry compounds. The purified pyridine sulphate is sprung [released] with a base such as ammonia. The crude wet bases are separated and dehydrated by distilling with benzene. Then they are fractionated. The analyses of a typical sample of crude pyridine bases is given below:

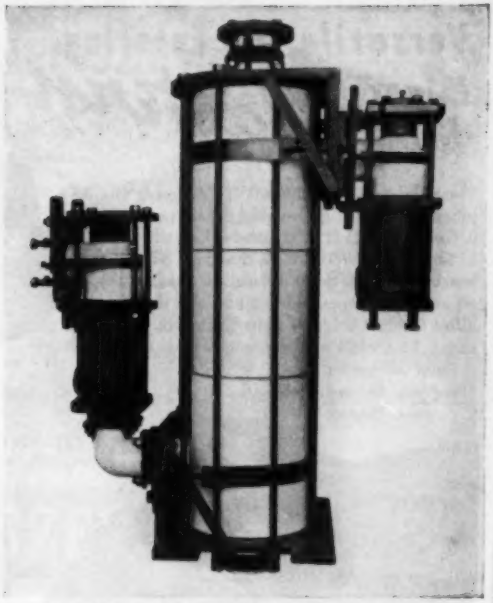
	Percent
Water	20
Pyridine	30
alpha-Picoline	10
131°-145°C. Bases	8
145°-160°C. Bases	8
Bases and tars > 160°C.	24

If it is desired to recover quinoline from coal tar the middle oil is washed with sulphuric acid in a similar procedure as above. The tar bases recovered may contain as much as 40 to 50 percent quinoline, along with high boiling pyridine homologs.

(Continued)



Worthington two-stage non-condensing ejector—porcelain



Worthington two-stage condensing unit—porcelain

How To Maintain an Uninterrupted Vacuum

in the presence of corrosive vapors

Use a Worthington corrosion-proof steam-jet ejector. These are made in stock sizes and specially engineered for handling any corrosive vapor problem in the chemical field.

For corrosive vapors, these ejectors are made with impervious graphite nozzles and diffusers. Suction chambers are of porcelain, but these can also be furnished of impervious graphite. Porcelain diffusers are also available.

For corrosion-*resistant* usage, Worthington makes ejectors of bronze, stainless steel or Worthite (a special Worthington "super-stainless").

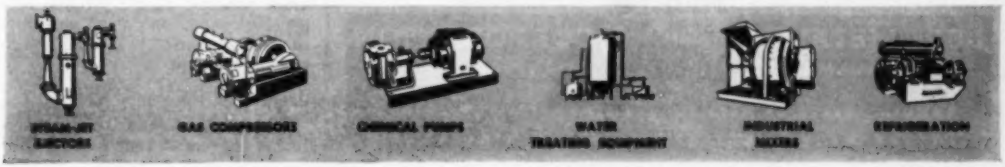
Worthington's is the *most complete* ejector line. A model for every vacuum requirement —from atmospheric to 50 microns absolute. Single and multiple stages. Condensing and non-condensing.

Put your problem—distillation, drying or any other vacuum problem—up to Worthington Pump and Machinery Corporation, Steam Power Division, Ejector Section, Harrison, New Jersey.

WORTHINGTON

STEAM POWER DIVISION

X1.2



Versatile Top Entering Mixer by Eastern

Versatile! Series C Vertical Mixers do big mixing jobs quickly and thoroughly. Their power range is from ¼ to 15 H.P. at standard speeds of 1725, 1140, 420, and 280 R.P.M. Standard NEMA ball-bearing type motor is furnished. Stuffing box is separate component and can be specified in any alloy for low original cost. Write our engineers about your mixing problem. Their service is without obligation.

Send now for new Eastern Mixer Catalog No. 600

Write for new Eastern Mixer Catalog No. 600

DEPT. SA

Eastern INDUSTRIES, Inc.

296 ELM STREET • NEW HAVEN 6, CONNECTICUT

DURAMETALLIC Packings

SAVE DOLLARS

"THE PACKING THAT IS ENGINEERED FOR THE JOB"

The bearing-like sealing provided by Durametallic Flexible Metallic Packing means minimum wear on rods, shafts and sleeves! Genuine maintenance savings for you in repair, replacement and shutdown costs. . . . .

"Always Specify DURAMETALLIC"

WRITE FOR DURAMETALLIC PACKING BULLETIN NO. 429CE

The PERFECT SEAL

DURAMETALLIC CORPORATION

KALAMAZOO MICHIGAN

MANUFACTURERS OF METALLIC and SEMI-METALLIC PACKINGS

ROTARY MECHANICAL SEALS and PACKING TOOLS

The mother liquor from the ammonium sulphate recovery may contain from 2 to 6 percent pyridine. There are several processes for the recovery of this pyridine. The liquor is neutralized, usually with ammonia, to liberate the pyridine bases. The crude wet bases are dehydrated and distilled in the same way as the bases from coal tar. The bases recovered from mother liquor contain higher quantities of pyridine than do the coal tar bases. The dry bases will contain perhaps 70 percent pyridine with relatively small quantities of picoline, lutidines and higher boiling bases.

At the present time the production capacity for 2 deg. pyridine in this country is around 2 million pounds per year. Imports have been relatively small. Crude pyridine bases are recovered at many coke plants in the U. S. but practically all of the refined pyridine is made by seven firms:

U. S. Steel	Clairton, Pa.
Pittsburgh Coke & Chem.	Neville Island, Pa.
Barrett	Frankford, Pa.
Koppers	Follanbee, W. Va.
Reilly Tar & Chemical	Cleveland, Ohio
Jones & Laughlin Steel Corp.	Pittsburgh, Pa.
Donner-Hanna Coke Corp.	Buffalo, N. Y.

Some increase in pyridine production may come from additional recovery installations and more efficient recovery systems, but the increased production will not be great. The coke capacity of the country may increase slightly in the next couple of years, but other factors, such as increased amounts of low volatile coals being used for coking will limit the amount of recoverable coal chemicals.

Pyridine has been used in small amounts as a solvent and intermediate for over a quarter of a century. During prohibition some pyridine was used for denaturing alcohol. The Zelan process for waterproofing created a substantial market for pyridine. Soon after this came the sulfa drugs derived from pyridine. New sulfa drugs, niacin or nicotinic acid, and the antihistamines then came along to create today's great demand. Today pharmaceuticals (including sulfa drugs, vitamins and antihistamines) consume 40 percent; Zelan-type waterproofing, 25 percent; and rubber, dyestuffs and misc., 35 percent.

This is the end-use pattern of 2 deg. pyridine, but not of the pyridine in crude pyridine. Crude pyridine may actually contain only small quantities of pyridine itself. It is used principally as a solvent.

ALPHA-PICOLINE

The total production of alpha-picoline at the present time is about 650,-

000 lb. per yr. This does not represent the total potential because one large pyridine producer recovers no alpha-picoline as such.

More than 50 percent of the alpha-picoline goes to vinyl pyridine that is used as a latex adhesive in heavy duty tires and V-belts. At the present time only relatively small amounts of vinyl pyridine are going into synthetic fibers for improving dyeability. This is potentially a large use for vinyl pyridine. The present limited supply has been a big handicap in this direction. A few percent of vinyl pyridine in several of the synthetic fibers greatly increases their dyeability. It is estimated that if vinyl pyridine could be made available in quantity the market for this chemical would be 4 to 5 million pounds per year by 1953. A lower price will also increase its usage in synthetic rubber.

This is where methylethylpyridine fits in the picture. The 2-methyl,5-ethylpyridine can be easily converted to 2-vinyl,5-ethylpyridine and 2-methyl,5-vinylpyridine. These alkyl vinylpyridines function like vinylpyridine by increasing the dyeability of certain synthetic fibers. De-alkylating these compounds to form vinyl pyridine is a possibility.

Since these vinyl pyridines will be produced in large quantities and at lower prices the demand for alpha-picoline should ease.

QUINOLINE

Up until last year total consumption of quinoline was around 2.5 million pounds per year. Almost all of it went into niacin. By more efficient recovery methods and additional installations quinoline is now being produced at the rate of around 3.2 million pounds per year. Now half goes into niacin, 45 percent into copper-8 hydroxyquinolinolate and 5 percent into 8-hydroxyquinoline pharmaceuticals.

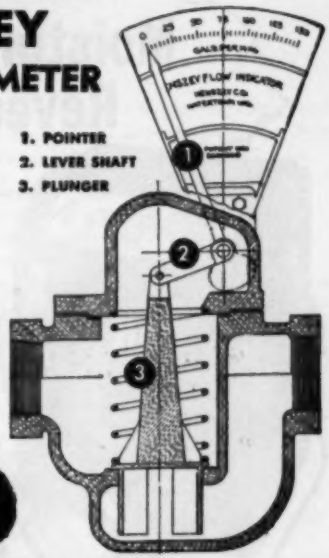
The copper salt of 8-hydroxyquinoline is a direct military use for mildew-proofing cloth. It is expected that the military demand will be greater in 1952. This will cut down the quinoline available for niacin manufacture. The 8-hydroxy quinoline is being made by the Skraup reaction but the process has not been too attractive and there are no announced plans to increase production by this means.

The use of quinoline in pharmaceuticals is growing. Primaquine, a new and promising antimalarial is a quinoline derivative that is not yet in commercial production.

Niacin (nicotinic acid) production is definitely being held back by the lack of quinoline. Niacin has been

(Continued)

Only 3 MOVING PARTS in the HENSZEY Indicating FLOW METER



Only three moving parts—the Pointer, the Lever Shaft and the Plunger. That means continued service and CONSTANT ACCURACY.

The liquid enters below the plunger, forcing it upward and exposing more area of the metering slots so that the motion is in direct proportion to the flow.

The graduations on the dial are uniformly spaced from one end to another and read direct—without constants. The meter is installed right in the pipe line.

For Details Consult Sweet's Catalog or Write

HENSZEY COMPANY
Dept. E-10, WATERTOWN, WISCONSIN

HENSZEY

Indicating FLOW METERS

Continuous Blowdown • Distillation System • Heat Exchangers
Feed Water Meters • Boiler Feed Regulators • Proportioning Valves
also MILK EVAPORATORS and PRE-HEATERS

for the RIGHT Answers to YOUR alloy fastening problems...

CALL HARPER!

HARPER CAN HELP YOU...

because Harper makes them *all*—has fastenings in exactly the *right* alloy, size, type and finish you need. Harper deals exclusively in non-ferrous and stainless steel fastenings—bolts, nuts, screws, rivets and accessories in brass, bronze, copper, aluminum, Monel and stainless steel that provide maximum resistance to corrosion, heat, abrasion and stress. Over 7000 items in stock ready for delivery from warehouses and distributors, nation-wide. Mail coupon for new catalog.

EVERLASTING FASTENINGS

The H. M. Harper Company
8206 Lehigh Ave., Morton Grove, Ill.
Send my copy of new Harper Catalog.
(Please print)

Name.....
Address.....
City.....State.....

Moisture Content Revealed !

This fully portable Marconi meter immediately reveals the true moisture content of a wide range of materials. Its operation, although giving half per cent or better accuracy, is simplicity itself with no weighing or calculation. The compression test cell is designed for uniform results and elimination of packing errors and the electronic circuits are stabilised against tube or line variations. Why not use this meter in your plant or mill and take advantage of modern industrial electronics.

• *Range from below air-dry to near saturation.* • *Covers paper and wood pulp, cotton, tobacco, flour, grain and seeds and many foodstuffs.* • *Alternative electrodes for different applications.* • *A.C. line or battery operated.*

THE MARCONI MOISTURE METER

Marconi Instruments

23-25, BEAVER STREET, NEW YORK 4

CANADA: Canadian Marconi Co., Marconi House, 2442, Trenton Avenue, Montreal

ENGLAND: Marconi Instruments Limited., St. Albans, Herts.

WIRE MESH

Maybe it all *does* look pretty much the same at first glance. But when a firm has been making wire mesh for 70 years man and boy, there's bound to be a little more to it than meets the eye — a little more know-how in engineering and weaving, a little more quality in the product, a little more service and satisfaction for the user.

JELLIFF WIRE MESH is woven in all ductile metals
JELLIFF WIRE MESH is woven in all commercial weaves
JELLIFF WIRE MESH is woven in widths up to 72 inches
JELLIFF WIRE MESH is economical. Every foot runs true to the specifications.

★ ★ ★ ★

JELLIFF WIRE MESH is a quality product and has been for 70 years. You can depend on it.

Write today for full details about JELLIFF WIRE MESH, JELLIFF WIRE MESH PRODUCTS, and JELLIFF'S CONSULTATION SERVICE on wire-mesh engineering. Address Department 16.

THE C. O. JELLIFF MFG. CORP.
DIPPING BASKETS · LEKTROMESH · RESISTANCE WIRE
WIRE MESH PARTS · WIRE CLOTH · STRAINERS · FILTERS
SOUTHPORT CONNECTICUT

produced in the past from such materials as nicotine, pyridine and beta-picoline, but quinoline affords the cheapest source of niacin.

The outlook for niacin is good. Its increased use in animal feeds is of particular interest. Hybrid corn is low in niacin and for use as animal feed must have niacin added to it. There is also an anti-niacin factor in corn which must be overcome by added niacin. In broiler feeds alone the present niacin demand in this country is 400,000 lb. per yr. while hog feed takes more than 800,000 lb. The greater use of soybean meal in replacing meat and fish products has created an increased demand for niacin. Thus, in animal feeds alone the demand is in the neighborhood of 1.5 million pounds per year.

How can niacin production be increased? Since little more quinoline or pyridine can be expected to be made available, niacin manufacturers are looking at the synthetic methylethylpyridine. Thus compound can be readily oxidized to the di-carboxylic acid which on decarboxylation gives niacin. With demand increasing, new niacin manufacturers can be expected to enter the picture. Most of the niacin is now made by Merck and the Barrett Division of Allied Chemical and Dye.

METHYLETHYLPYRIDINE

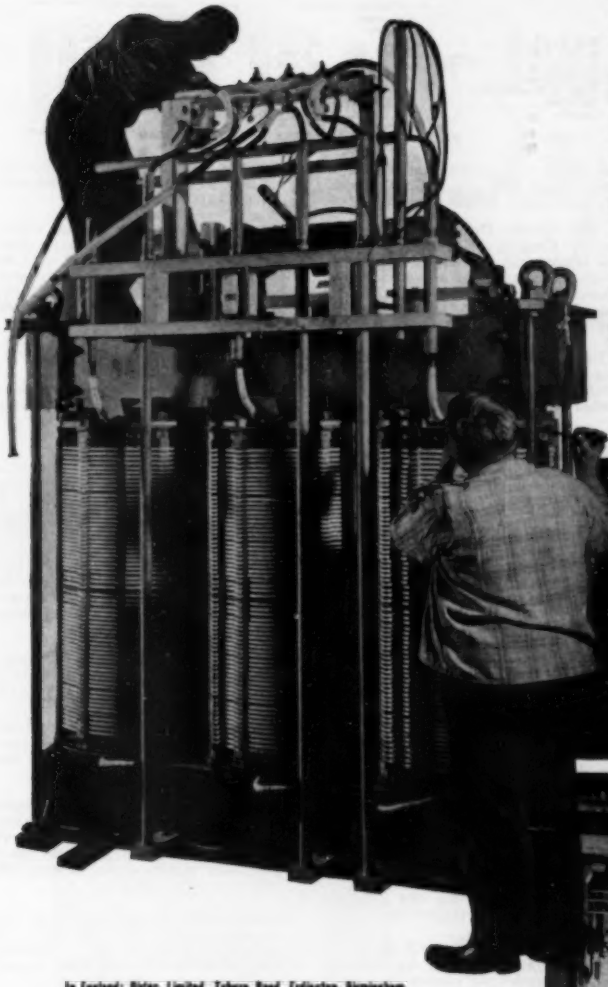
Carbide and Carbon Chemical Corporation is erecting a plant in Institute, W. Va., which will have a capacity of several million pounds per year of methylethylpyridine. They are due to go into production about the first of the year. The process is reported to use acetaldehyde and ammonia as raw materials.

Phillips Chemical plans a $3 million plant for the production of methylethylpyridine and methylvinylpyridine. The production capacity for the latter chemical will be around 2 million pounds per year. It is expected that there will also be recovered about 1 million pounds per year of byproducts, including pyridine and picolines. The Phillips plant is scheduled to start operation by the middle of 1952.

Most of the vinyl pyridines from Carbide and Phillips will go into synthetic fiber production. Du Pont and Chemstrand are known to have an interest in vinyl pyridine for this purpose.

Niacin manufacture will take most of the remaining consumption. Other uses are being developed and the future for these new pyridines seems promising. —*End*

Where one drop of WETth could cost thousands of dollars—
DRY your air with Lectrodryers

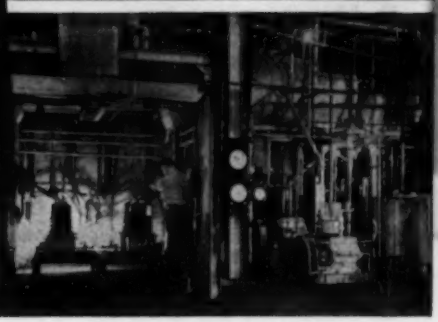


If your product must be put together, processed or packed in an atmosphere free from WETth (unwanted moisture)—DRY your air with low-cost, trouble-free Lectrodryers*.

Where needed to protect against deterioration due to WETth (unwanted moisture), General Electric uses Lectrodryers to DRY air in the special rooms where some types of transformers and similar equipment are assembled.

Need DRY air? Our engineers will be glad to give you the benefit of their 20 years' experience in solving WETth problems. Simply write, wire or phone Pittsburgh Lectrodryer Corporation, 303 32nd Street, Pittsburgh 30, Pa.

Lowering a transformer into the DRY assembly room where the men at left are working.



In England: Birtec, Limited, Tyburn Road, Erdington, Birmingham.
In Australia: Birtec, Limited, 51 Parramatta Road, Globe, Sydney.
In France: Stein et Roubaix, 24 Rue Erlanger, Paris XVI.
In Belgium: S. A. Belge Stein et Roubaix, 320 Rue du Moulin, Brussaux-Liege.

This cell is kept DRY by these Lectrodryers.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

* REGISTERED TRADEMARK U.S. PAT. OFF.

New Construction

	Current Projects		Cumulative 1951	
	Proposed Work	Contracts	Proposed Work	Contracts
New England	.....	$3,150,000	$2,382,000	$8,786,000
Middle Atlantic	$8,000,000	2,656,000	24,880,000	99,556,000
South	15,000,000	47,640,000	178,490,000	222,393,000
Middle West	40,000,000	17,200,000	125,958,000	180,851,000
West of Mississippi	43,610,000	131,396,000	294,747,000	439,284,000
Far West	10,000,000	20,000,000	38,581,000	64,180,000
Canada	.....	.....	162,877,000	185,028,000
Total	$116,610,000	$222,042,000	$815,885,000	$1,200,718,000

Proposed Work

Ill., Chicago—Allied Chemical & Dye Corp., Barrett Div., 40 Rector St., New York, N. Y., plans to construct a chemical plant here. Estimated cost $30,000,000

La., New Orleans—Freeport Sulphur Co., Freeport, Tex., plans to construct a sulphur mining and processing plant. Estimated cost $15,000,000

Nev., Henderson—Western Electro Chemical Co., Henderson, plans to construct a new plant here. Estimated cost $10,000,000

O., Painesville—Diamond Alkali Co., Union Commerce Bldg., Cleveland, plans a two year expansion program to increase the production of caustic soda and chlorine by the electrolytic method. Estimated cost $10,000,000

Pa., Danville—Merck & Co., 126 East Lincoln Ave., Rahway, N. J., plans to construct a plant here. Estimated cost $8,000,000

Tex., Houston—Alamo Chemical Co. (General Aniline & Film Co., The Borden Co. and Phillips Chemical Co.) Irish Bend Island, plans to construct a chemical plant to produce anhydrous ammonia. Estimated cost $38,260,000

Tex., Midland—Tex-Harvey Gasoline Plant, Inc., and Anchor Gasoline Corp., Atlas Bldg., Tulsa, Okla., plans to construct a high-pressure absorption type gasoline plant. Estimated cost $5,350,000

Contracts Awarded

Ala., Mobile—Courtaulds, Inc., c/o H. K. Ferguson Co., 1783 East 11th St., Cleveland, O., contractor, will construct a rayon weave plant here. Estimated cost $10,000,000

Fla., Palatka—Hudson Pulp & Paper Corp., Palatka, has awarded the contract for plant additions to Hillyer & Lovan, 666 Dyal St., Jacksonville. Estimated cost will exceed $200,000

Fla., Port St. Joe—St. Joe Paper Co., Port St. Joe., has awarded the contract for special building for housing paper box machinery to The Austin Co., M & M Bldg., Houston, Tex. Estimated cost $700,000

Ill., Chicago—Pioneer Paper Stock Co., 448 West Ohio St., Chicago, has awarded the contract for a waste paper processing plant, warehouse and office to Ragner Benson, Inc., 4744 West Rice St. Estimated cost $2,000,000

Ind., Hammond—Lever Bros., 505 Park Ave., New York, N. Y., have awarded the contract for a warehouse to Bechtel Corp., 3780 Wilshire Blvd., Los Angeles, Calif. Estimated cost $4,000,000

Ind., Whiting—Standard Oil Co. of Indiana, 910 South Michigan Ave., Chicago, Ill., has awarded the contract for a sulphur plant to Fluor Corp., Ltd., 360 East 2nd St., Los Angeles. Estimated cost $1,700,000

Kan., Ulysses—Stanolnid Oil & Gas Co., Stanolind Bldg., Tulsa, Okla., has awarded the contract for a gasoline plant addition to Stearns-Roger Mfg. Co., 1720 California St., Denver, Colo. Estimated cost $2,750,000

La., Lake Charles—Davison Chemical Co., Davison Chemical Bldg., Baltimore, Md., has awarded the contract for a plant to produce micro-spheroidal type of synthetic silica-alumina catalyst, to Day & Zimmerman, Inc., Packard Bldg., Philadelphia, Pa. Estimated cost $7,000,000

La., Louisa—United Carbon Co., United Carbon Bldg., Charleston, W. Va., will construct a carbon plant here with own forces. Estimated cost $2,000,000

La., Shreveport—Stanolind Oil & Gas Co., Tulsa, Okla., has awarded the contract for a gasoline stripping refinery unit to Blaw-Knox Co., Farmers Bank Bldg., Pittsburgh, Pa., at $2,225,000

Mass., Springfield—Monsanto Chemical Co., 812 Monsanto Ave., has awarded the contract for a plastics manufacturing plant addition to Penker Co., 1030 Summer St., Concinnati, Ohio. Estimated cost $3,000,000

Mass., Springfield—Shawinigan Resins Corp., 644 Monsanto Ave., has awarded the contract for a control laboratory at Indian Orchard to Adams & Ruxton Construction Co., 1387 Main St., Springfield. Estimated cost $150,000

Minn., Duluth—International Refineries, Inc., 227 Colfax Ave., N., Minneapolis, has awarded the contract for an oil refinery, including fluid catalytic cracking unit, to Lummus Co., 385 Madison Ave., New York, N. Y. Estimated cost $7,000,000

Miss., Vicksburg—Spencer Chemical Co., Pittsburgh, Kan., has awarded the contract for a chemical plant to Quaker Valley Construction Co., P. O. Box 604, Pittsburg, Kan. Estimated cost $15,000,000

Mo., Sugar Creek—Standard Oil Co. of Indiana, 910 South Michigan Ave., Chicago, Ill., has awarded the contract for a crude running and coking plant unit to Lummus Co., 385 Madison Ave., New York, N. Y. Estimated cost $22,000,000

N. J., Morristown—The Mennen Co., 347 Central Ave., Newark, has awarded the contract for a manufacturing plant to George A. Fuller Co., 597 Madison Ave., New York, N. Y. Estimated cost $2,656,600

N. C., Charlotte—Reichhold Chemicals, Inc., 30 Rockefeller Plaza, New York, N. Y., has awarded the contract for an addition to its chemical plant to South Eastern Construction Co., 301 West Second St. Estimated cost $1,000,000

N. C., Roanoke Rapids—Roanoke Rapids Paper Co., c/o H. K. Ferguson Co., 1783 East 11th St., Cleveland, O., contractor, will construct a box board plant. Estimated cost $3,315,000

O., Toledo—Pure Oil Co., 35 East Wacker Dr., Chicago, Ill., has awarded the contract for a catalytic cracking unit with a 15,000 bbl. gas-oil capacity daily and a polymerization unit, to M. W. Kellogg Co., 225 Bway., New York, N. Y. Estimated cost $7,000,000

Okla., Chester—Warren Petroleum Corp., Natl. Bank Bldg. Tulsa, has awarded the contract for a natural gasoline plant and five 2,500 hp. compressors, to Gasoline Plant Construction Corp., N. Esperson Bldg., Houston, Tex. Estimated cost $1,585,570 and $985,000 respectively.

Okla., Bristow—Wilcox Oil Co., 310 West 6th St., Tulsa, has awarded the contract for a 1,500 bbl. high octane refinery addition to Procon Corp., 310 South Michigan Ave., Chicago, Ill. Estimated cost $1,500,000

Tex., Houston—Houston Oxygen Co., 3602 West 11th St., will construct a plant for the manufacture of liquid oxygen, nitrogen and argon. Work will be done by subcontracts. Estimated cost $875,000

Tex., Kingsville—Celanese Corp., Kingsville, will enlarge its chemical plant. Work will be done by owners. Estimated cost $3,400,000

Tex., Pecos—Pecos Petroleum Co. & Associates, Pecos, will enlarge its gasoline plant. Work will be done by purchase and hire. Estimated cost $900,000

Tex., Rockdale—Aluminum Co. of America, Port Lavaca, will construct an aluminum smelting and processing plant. Work will be done by separate contracts under owner's supervision. Estimated cost between $90,000,000 and $100,000,000

Wash., Everett—Weyerhaeuser Timber Co., Tacoma Bldg., Tacoma, has awarded the contract for a pulp mill to L. H. Hoffman Co., 715 S. W. Columbia Blvd., Portland, Ore. Estimated cost $20,000,000

W. Va., Martinsburgh—E. I. du Pont de Nemours & Co., Inc. du Pont Bldg., Wilmington, Del., will construct an explosives plant here using own forces. Estimated cost $5,000,000

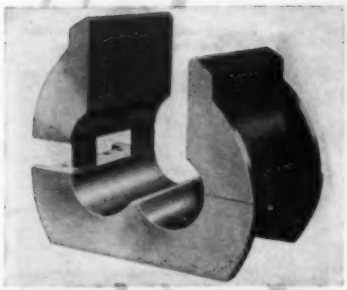
W. Va., Parkersburg—Corning Glass Co., Walnut St., Corning, N. Y., has awarded contract for design and construction of a 1 and 2 story warehouse to H. K. Ferguson Co., 1783 East 11th St., Cleveland, O. Estimated cost $1,200,000

Wis., Manitowoc—Manitowoc Portland Cement Co., Manitowoc, has awarded the contract for 1 and 2 story plant additions to Kasper Construction Co., 1203 North 16th St. Estimated cost $2,500,000

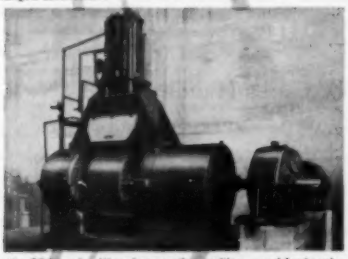
For Processing Plastics, Rubber, Asphalt Tile

and Similar Materials . . .

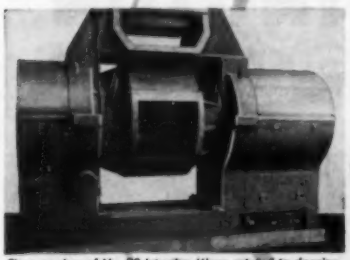
Specify Struthers Wells INTENSIVE MIXERS!



New Three-Piece Trough, easily removable, provides minimum down time for repair or replacement. Left side is blocked up to show flanged construction.



No. 30 Intensive Mixer in operating position—used for breakdown of rubber. Capacity: 165 lbs. crude rubber.



Close-up view of No. 30 Intensive Mixer, rotated to cleaning and inspection position. Will rotate to discharge directly downward.

Struthers Wells Intensive Mixers are ideal for processing plastics, rubber, asphalt tile and other materials difficult to process or of an abrasive nature. Mixing is accomplished by a pair of parallel rotors. The material is confined by a compression ram which provides intensive working action for rapid breakdown and mixing of the batch. The trough, ram and rotors permit heating or cooling as required.

The main rotating elements of the machine are contained in one integral and rugged barrel unit, which is set in trunnion stands. The mixing chamber is open only at the top, and does not have a gate or valve in the bottom. It is water-tight, and compounding oils may be placed in the mixer first if desired.

The machine is charged from the top into the mixing chamber. The cross section of this chamber is UU-shaped. For discharging, the mixing chamber is rotated until it approaches an inverted position. For cleaning and inspection it is placed in a horizontal position. A wide opening makes the chamber very accessible.

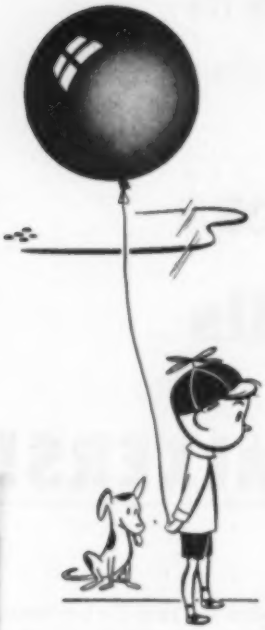
The design and construction of Struthers Wells Intensive Mixers—backed by years of research and progressive improvement—is your assurance of the ability and versatility of our engineers and craftsmen to meet your specific mixing requirements, regardless of how different or difficult they may be.

Struthers Wells

STRUTHERS WELLS CORPORATION

Mixer Division—Titusville, Pa.

Plants at Titusville and Warren, Pa.—Offices in Principal Cities

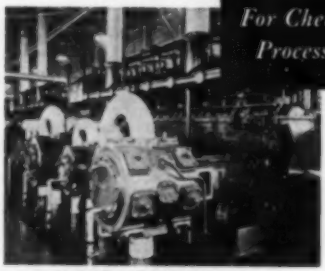


If it's a gas that can be handled ...WORTHINGTON COMPRESSORS *Handle it Better!*

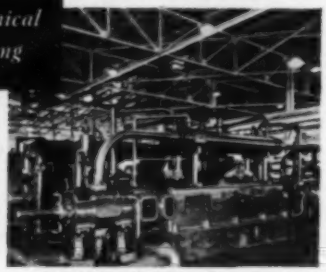
Steam Driven Compressors in a Synthetic Glycerine Plant.

Steam Driven High Pressure Circulators in a Nitrogen Fixation Plant.

Typical Worthington Compressor-Installations For Chemical Processing



Angle Gas Engine Driven Compressors in a Gas Oxidation Plant.



Motor Driven Multi-Stage Compressors, used in Liquefaction of Air.

Keeping pace with the chemical industries' rapid progress, Worthington builds compressors for the widest range of gases. More than that, Worthington maintains a staff of specialists whose sole job is to know — or to find out — the answers to all problems concerning gas compression.

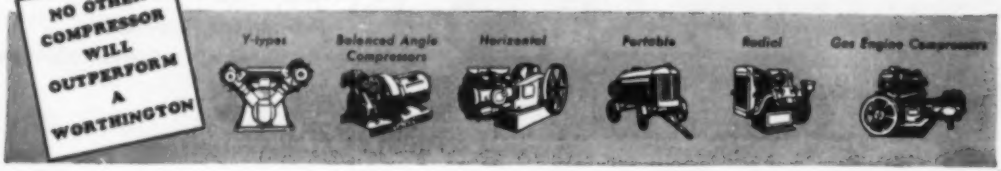
That is why your own applications in this field can be best served by Worthington . . . with compressors that will perform more efficiently and economically over a longer service life. Why not get the whole story that proves *there's more worth in Worthington*? Write, describing your requirements, to *Worthington Pump and Machinery Corporation, Compressor Division, Buffalo, N. Y.*

Partial List Of Gases Handled By Worthington Compressors

Butane • Propane • Butadiene • Carbon Monoxide • Carbon Dioxide • Acetone Benzole Mixture
Sulphur Hexafluoride • Coke Oven Gas • Ethylene • Ethylene Dichloride • Furfural • Hydrogen
Hydrogen Chloride • Hydrogen Sulphide • Methyl Chloride • Methyl Ethyl Ketone • Nitrous Oxide
Oxygen • Sulphur Dioxide • Vinyl Chloride • Ethylene Oxide

WORTHINGTON

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON



WYANDOTTE ANNOUNCES

Another FIRST!

KREELON CD

the only promoted industrial detergent on the market!

It's a fact! Kreelon* CD is the first promoted industrial detergent ever offered in one product —the only product of its kind on the market today. Developed by Wyandotte and available only at Wyandotte, it combines the advantages of an excellent synthetic detergent and an excellent detergent-promoter.

What does this mean to you? Essentially this: by replacing the anionic detergent you're now using with Kreelon CD, you can make a superior cleaning compound easier, faster, cheaper. That applies to general household cleaners, laundry compounds, scouring powders, building maintenance cleaners, metal cleaners, etc. Kreelon CD is excellent for processing cotton, wool, silk and synthetics.

Strong claims—yes, but we can back them up. Let us show you how much Kreelon CD can improve the detergency values of your product. We'll be glad to work with you—no obligations, of course. Get the jump on competition—write us today.

Fast facts about Kreelon CD

- In properly compounded cleaners, Kreelon CD can be substituted for the anionic detergent you're now using — and you'll get 20% to 70% improvement of soil removal and whiteness retention in your finished product.
- Kreelon CD dissolves rapidly — is easy to use, fast-acting.
- Kreelon CD is dustless — compounding is easier and plant housekeeping chores are minimized.
- Kreelon CD is economical. A promoted detergent containing Carbose*, it gives you the advantages of a synthetic detergent and detergent-promoter in one product. It's ready to use — saves you storage space, handling and mixing time.
- Kreelon CD in your product reduces skin irritation — promotes long-lasting suds that are smooth and gentle to the hands.

*Reg. U. S. Pat. Off.

SODA ASH • CAUSTIC SODA • BICARBONATE OF SODA
CALCIUM CARBONATE • CALCIUM CHLORIDE • CHLORINE
HYDROGEN • DRY ICE • SYNTHETIC DETERGENTS • GLYCOLS
CARBOSE (Sodium CMC) • ETHYLENE DICHLORIDE • PROPYLENE
DICHLORIDE • AROMATIC SULFONIC ACID DERIVATIVES
OTHER ORGANIC AND INORGANIC CHEMICALS

Wyandotte CHEMICALS
REG. U. S. PAT. OFF.
Wyandotte, Michigan
OFFICES IN PRINCIPAL CITIES

Automatic CONTROL *...at its Simplest!*

TAG Non-Indicating Controllers

Regulate Temperature and Pressure

SELF OPERATED TEMPERATURE OR PRESSURE CONTROLLER

Controls temperature (as shown) or pressure.

•

Requires no air or electric power supply.

STEAM OPERATED TEMPERATURE OR PRESSURE CONTROLLER

Controls steam pressure (as shown) or temperature (dotted line).

•

Operates on upstream steam supply. Needs no air or electric power.

"FAULTLESS" TEMPERATURE CONTROLLER

Controls temperature only.

•

Operates diaphragm valve on 18 p.s.i. air supply.

"SIMPLEX" PRESSURE CONTROLLER

Controls pressure only.

•

Operates diaphragm valve on 18 p.s.i. air supply.

NO. 42 TEMPERATURE OR PRESSURE CONTROLLER

Controls temperature or pressure.

•

Operates diaphragm valve on 18 p.s.i. air supply.

Long life, trouble-free service and ease of maintenance are inherent characteristics of TAGliabue Non-Indicating Controllers. When your purpose is to devise a temperature or pressure control system at its simplest, these TAG controls will often prove the answer. Send now for your copy of Catalog No. 900, which gives you 36 pages of detailed data on these instruments and related equipment.

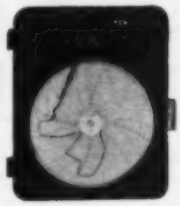
TAGLIABUE INSTRUMENTS DIVISION

WESTON ELECTRICAL INSTRUMENT CORPORATION

614 Frelinghuysen Avenue, Newark 5, New Jersey

TAGliabue Pressure Recorder Charts Up To 7,500 P.S.I.

Catalog No. 1210 Recording Pressure Gages, available from TAGliabue Instruments Div., Dept. 67, Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J. combine simple design with accurate calibration. They provide permanent records of vacuum or pressure on either 10-inch or 12-inch circular charts.



Interchangeable tube systems of these TAG instruments are laboratory calibrated at the factory. Safety links provide over-range protection. These recorders are supplied in various ranges between the limits of 30 in. vacuum and 7,500 lb. per sq. in. pressure.

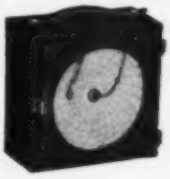
TAGliabue Dial Thermometers Provide Remote Indications

Temperatures are accurately shown at a distance from the sensing element with the Dial Indicating Thermometers produced by TAGliabue Instruments Div., Dept. 67, Weston Electrical Instrument Corp., Newark 5, N. J. These sturdy devices are furnished with mercury, gas filled or vapor tension actuations in 5, 6 and 8" dial sizes.

The plain black pointer and figures make TAG Dial Indicating Thermometers easy to read. The instruments are made in two types, for flush or wall mounting, with cases of iron, brass or phenolic plastic. Models are available to indicate as low as −325°F. or as high as 1000°F.

Temperatures in Mobile Units Charted by Miniature Recorder

A continuous record of temperatures in heated, refrigerated or air conditioned spaces is provided by a miniature self-contained recording thermometer developed by TAGliabue Instruments Div., Dept. 67, Weston Electrical Instrument Corp., Newark 5, N. J. This new instrument, known as the TAG Model 8475 Miniature Recorder, requires no connection to any power supply, yet charts temperatures for as long as seven days without attention.



Its unique design eliminates need for shockproof mounting. Temperatures as low as −30°F. or as high as +220°F. can be recorded. The instrument measures 5¾" x 5¾" x 4¼", and weighs 3½ pounds.

A Headline that is also a Helpline!

1. BUFLOVAK CHEMICAL AND FOOD PRODUCT EVAPORATORS

2. PROFITABLY MEET YOUR EXACTING REQUIREMENTS

3. BY DOING THE JOB BETTER AT LOWER COST

4. AND THE RESULT FOR YOU — GREATER PROFITS

1. For concentrating Chemicals, Pharmaceuticals, Antibiotics, and Food Products, BUFLOVAK Evaporators offer worthwhile operating advantages.

2. Advance design, in many types, with such features as low operating temperatures, high vacuum, immaculate cleanliness, simplified operation, and automatic controls, give you the product you want.

3. By making what you want, the way you want it, quicker, easier and better.

4. And by saving heat, recovering illusive solids, and shaving off costs, the end result is Greater Profits!

May we send Catalog 351?

Buflovak Equipment

DIVISION OF BLAW-KNOX CO. 1549 FILLMORE AVE., BUFFALO 11, N. Y.

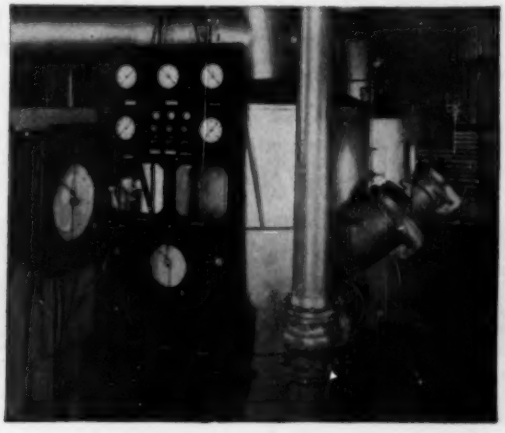
BUFLOVAK RESEARCH AND TESTING LABORATORY

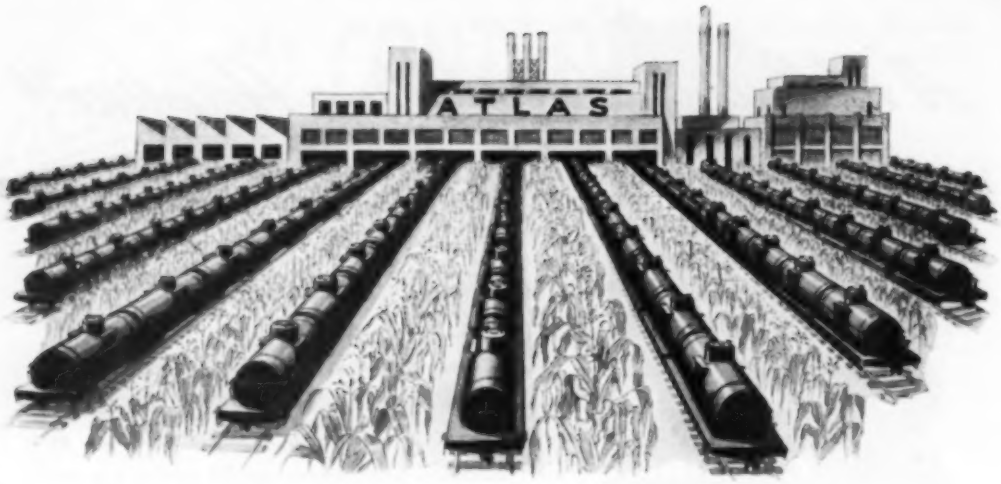
BUFLOVAK BUILDS

EVAPORATORS
Low Temperature
By-Product Recovery
Chemicals
Food Product
Crystallization

DRYERS
Vacuum Double Drum

Impregnators
Dopp Kettles
Solvent Recovery
Distillation Equipment





NOW! Sorbitol is ready

to help you cut your polyol costs!

Big news for manufacturers of resins, tobacco products, adhesives, flexible films, pharmaceuticals!

Sorbitol—the hexahydric alcohol derived from corn sugar and other natural sugars—is now available in quantity from new Atlas plant facilities just completed.

Its price will remain at the same low, stable level . . . unaffected by shortages or inflation since it comes from abundant raw materials and is not a by-product.

A member of the same chemical family as glycerin and the glycols, sorbitol has many unique features of its own. Not a substitute, it must be evaluated on its own merits.

Atlas sorbitol production is now ten times its 1947 volume! And Atlas will expand its sorbitol facilities again as future requirements demand it.

Place your order today for immediate delivery, or write for further information. A new book about sorbitol is yours for the asking. And remember, if sorbitol doesn't quite fit *your* needs, Atlas makes many other special polyol combinations.

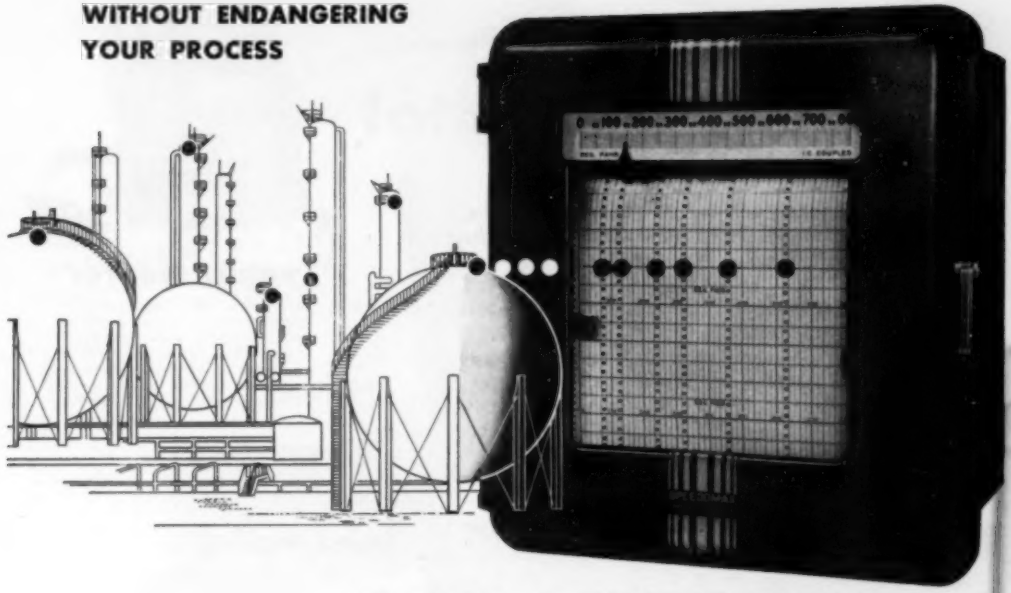
ATLAS INDUSTRIAL CHEMICALS DEPARTMENT

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address—Atpowco*
ATLAS POWDER COMPANY, CANADA, LTD., Brantford, Canada

HOW TO CENTRALIZE OPERATING DATA *and save money*

WITHOUT ENDANGERING YOUR PROCESS



In as little time as 2 seconds per point, Speedomax Multiple-Point Recorders centralize data about temperatures or other conditions scattered throughout process units.

Centralizing operating data from process units on one recording instrument pays off. It saves panel space. It lowers the recording cost per point. It warns of upsets in ample time for your men to act. It does all this . . . IF the instrument checks operating conditions frequently enough—fast enough.

With Speedomax Multiple-Point Recorders, you get not only the inherent savings in centralized data, but maximum information about critical process operations. At the fast rate of 2 seconds per point (or 3 or 4 seconds, if preferred), they can whip through as many as 16 or 20 similar variables in as little as 32 or 40 seconds. Where an extremely critical variable is involved, that point can be recorded more frequently than the others —in the sequence of 1, 2, 1, 3, 1, 4, 1, 5, etc.

In addition to this recording speed, other features give superior performance. A soundly-designed amplifier and electronic circuit assure unusual accuracy and sensitivity over range spans as narrow as 100 F. Instrument performance is unaffected by vibration. The quantity measured may be temperature, pH, speed, weight or electrical load.

The next time you want to bring temperatures or other data to a central point, make sure you do it safely . . . by getting the speed you need to guard against sudden upsets. Specify Speedomax Multiple-Point Recorders. For additional information about these instruments, just check the coupon and return.

LEEDS & NORTHRUP CO.

LEEDS & NORTHRUP CO.
4916 Stenton Ave., Phila. 44, Pa.

Please send Speedomax Catalog ND46.
Please send information about applying Speedomax Multiple-Point Recorders to

(Name) (Title)
(Firm)
(Address)

Jri. Ad ND46-700(1)

for products with piping that must **flex, bend** or **vibrate!**

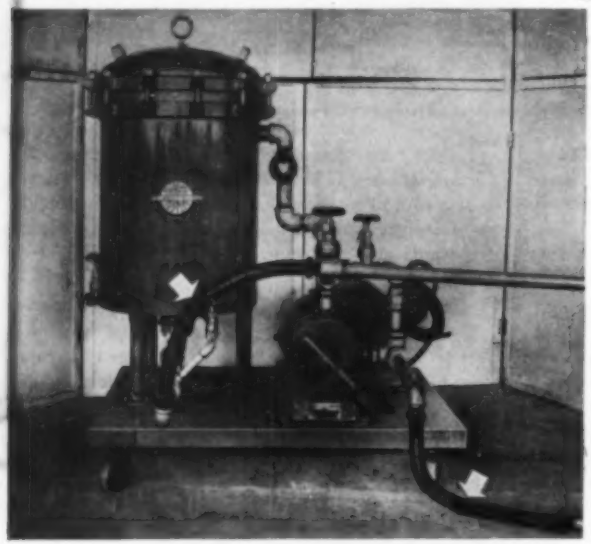
vapor steerer

American ⅝" I.D. Aluminum Flexible Metal Hose provides a convenient adjustable duct for directing healing vapor from this "Vapor All" Vaporizer Inhalator to where it is needed. It's tight, light, sanitary and rust proof. Courtesy Sanit-All Products Corporation, Greenwich, Ohio.

These three products have only one thing in common—piping that moves, bends or vibrates. And for all three, there's a type of American Flexible Metal Hose or Seamless Flexible Metal Tubing to meet the need.

There's a type of versatile, flexible American Metal Hose to improve your product's performance . . . to convey liquids, gases or semisolids under severe conditions of temperature, pressure . . . to minimize vibration, to connect misaligned piping and ports. Let us send you Bulletins SS-50 and CC-300 with the full details. The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada: The Canadian Fairbanks-Morse Company, Ltd.

81260



inlet-outlet

American 1" I.D. Steel Seamless Flexible Metal Tubing connects this filter made by the Sparkler Mfg. Co., Mundelein, Ill. at inlet and outlet, with rigid pipe leading to vat or other liquid container. Tight and strong, it makes connecting and disconnecting the unit quick and easy—minimizes vibration while in operation.

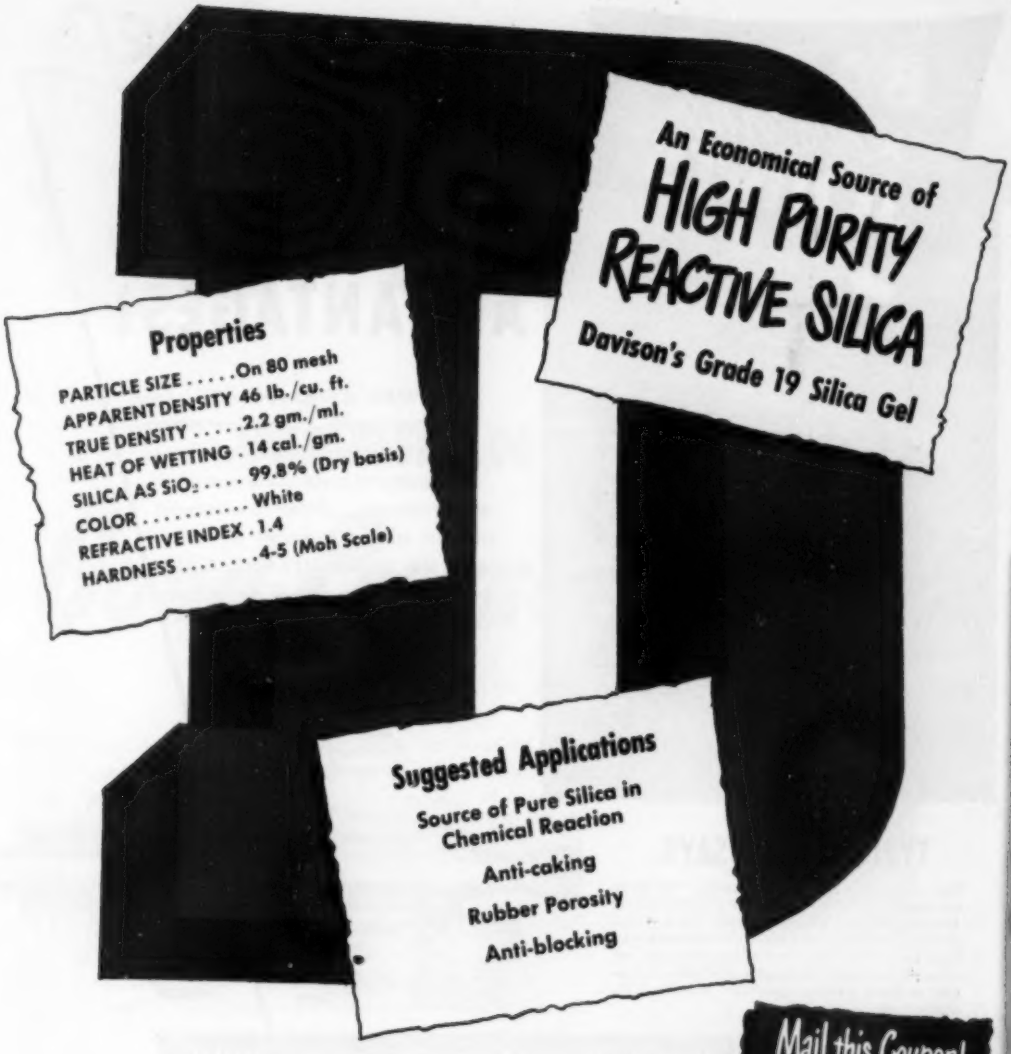
tar baby

Pouring hot tar for roadway repairs is usually a slow and messy procedure—except when you do it this way with a mobile tar kettle such as this made by Littleford Bros. of Cincinnati, Ohio. Here the tar is dispensed by pump through a 1" I.D. armored and insulated American Flexible Tar and Asphalt Hose connected to a nozzle. It's a good example of the versatility of American Flexible Metal Hose and Tubing in handling almost anything that flows.

wherever connectors must move . . .

American ANACONDA

FLEXIBLE METAL HOSE AND TUBING


An Economical Source of
HIGH PURITY
REACTIVE SILICA
Davison's Grade 19 Silica Gel
Properties
PARTICLE SIZE . . . . . On 80 mesh
APPARENT DENSITY 46 lb./cu. ft.
TRUE DENSITY . . . . . 2.2 gm./ml.
HEAT OF WETTING . 14 cal./gm.
SILICA AS SiO_2 . . . . 99.8% (Dry basis)
COLOR . . . . . White
REFRACTIVE INDEX . 1.4
HARDNESS . . . . . 4-5 (Moh Scale)
Suggested Applications
Source of Pure Silica in Chemical Reaction
Anti-caking
Rubber Porosity
Anti-blocking

Davison Grade 19 Silica Gel is an amorphous, extremely porous form of silica. It is odorless, a non-conductor of electricity and has a high adsorptive capacity for gases and liquids.

Davison silica gel can be produced in many variations to assure maximum efficiency in your particular application.

Send the coupon for further information and prices on Davison Grade 19 Silica Gel . . . four-page folder giving chemical and physical properties and suggested applications on all dependable Davison products.

Progress through Chemistry

THE DAVISON CHEMICAL CORPORATION

Baltimore 3, Maryland

PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, PHOSPHATE ROCK, SILICA GELS, SILICOFLUORIDES AND FERTILIZERS

Mail this Coupon!

THE DAVISON CHEMICAL CORPORATION
INDUSTRIAL CHEMICAL DIVISION
BALTIMORE 3, MD.

☐ Please send me information and prices on Davison Grade 19 Silica Gel

☐ Four-page folder on dependable Davison products

NAME.....

TITLE.....

FIRM.....

ADDRESS.....

CITY.....

ZONE.....STATE.....

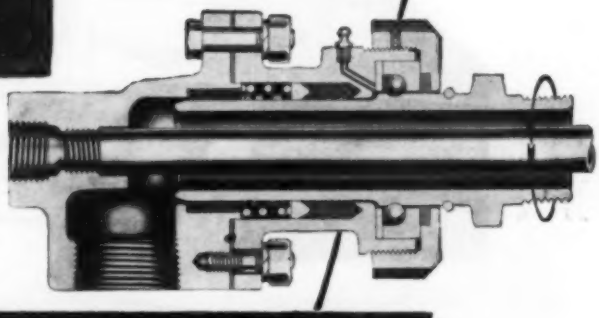
BARCO *Revolving* JOINTS

USERS REPORT ... Many ADVANTAGES!

POWER savings up to 50%... long, leakproof service... very low requirements for maintenance... quick, easy accessibility of parts... better temperature control... ability to withstand vibration and hard usage — these are just a few of the ADVANTAGES reported by the many users of BARCO REVOLVING JOINTS!

TYPICAL USER SAYS:

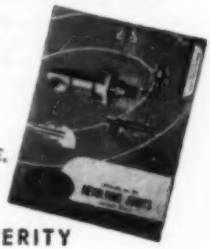
User of hundreds of joints on calenders, sanforizers, dry cans and chill rolls, Mr. S. Barnson, Chief Engineer, American Finishing Company writes, "We are well pleased... I hope to have entire plant equipped with Barco joints." Formerly, it was considered exceptional to have 75% of joints leak-free. Today, with the changeover to Barco nearing completion, virtually 100% leak-free service is the rule.



IMPROVED TYPE IBR REVOLVING JOINT

Here is the new, *improved* Type IBR Barco Revolving Joint! It is precision-built in *single flow* and *syphon styles* for handling steam, water, air, oil, gas, or chemicals. Note wide spacing between bearings. Inherent low torque is little affected by pressure, speed, or temperature. Light running action minimizes wear, permits free-floating installation. No adjusting necessary. For the complete story, send today for new Bulletin No. 300. *Worldwide sales and service; ask for recommendations.* BARCO MANUFACTURING CO., 1816 L Winnemac Ave., Chicago 40, Ill. In Canada: The Holden Co., Ltd.

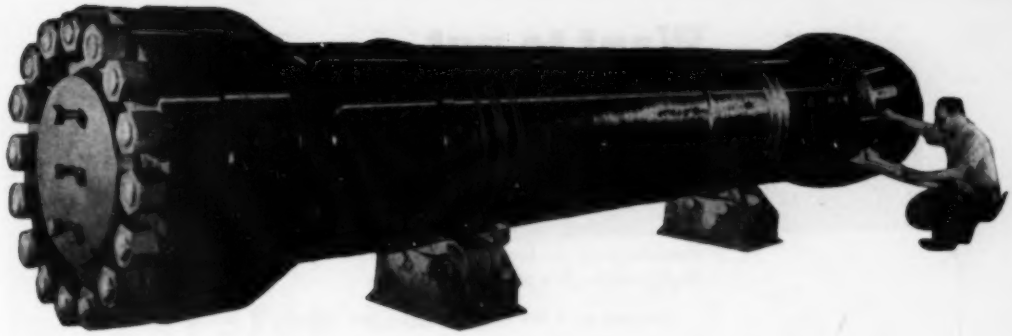
SEND FOR NEW BULLETIN 300



BARCO

THE ONLY TRULY COMPLETE LINE OF FLEXIBLE, SWIVEL, SWING AND REVOLVING JOINTS

FREE ENTERPRISE—THE CORNERSTONE OF AMERICAN PROSPERITY



WARRANTY OF A *Good Pressure Vessel*

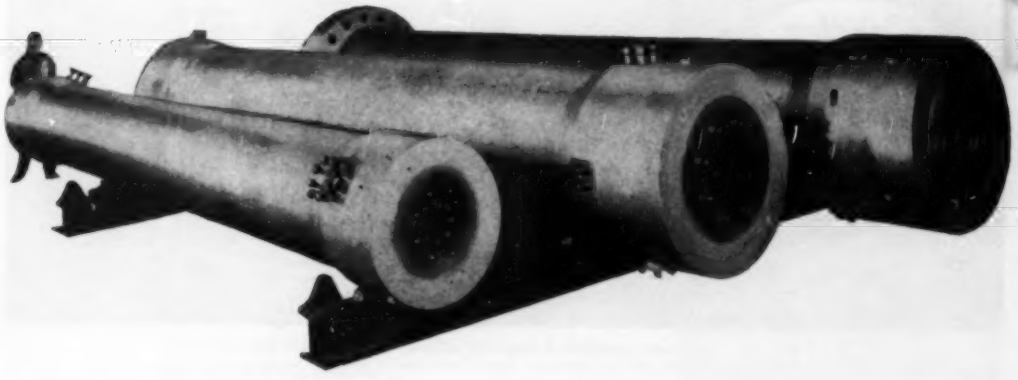
BETHLEHEM is a name that for many years has stood for good forged pressure vessels. An order placed with Bethlehem is placed in competent hands; it is your warranty of a vessel well built. Every operation, from the making and forging of the steel to the final assembly and testing, is handled with typical Bethlehem care and attention to detail.

Our facilities enable us to turn out forged, seamless vessels in virtually any size and type and with any desired wall thickness. Check with us when considering units for the chemical industry, or for use in various allied fields. You'll find we have a friendly, capable, experienced staff that can talk your language.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation



Want to put waste steam to work . . . ?

. . . chilling water for refrigeration? Our Absorption Refrigerating Machine gives one ton of refrigeration for twenty pounds of your steam. High pressure, low pressure. Or waste.

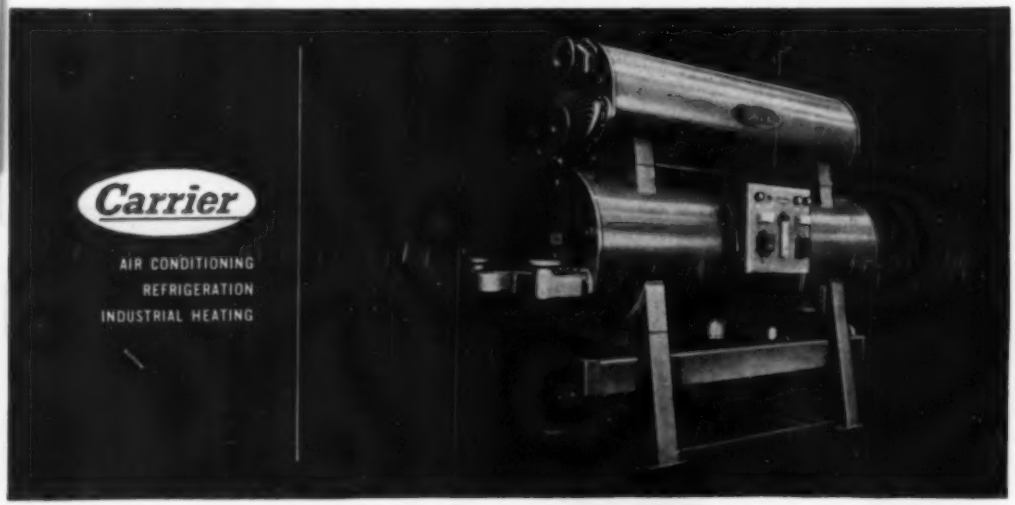
So you see it fits easily into the heat balance of an industrial plant. It has practically constant efficiency at all loads. And it automatically adjusts itself to loads down to 10% of capacity.

The absorbent is a simple salt. Non-toxic, non-inflammable, non-explosive, non-evaporating salt. And not very expensive. The refrigerant is the cheapest you can use. Water.

There are no moving parts in the Carrier Absorption Refrigerating Machine except for a small solution pump of 15 hp. or less. No moving parts means no wearing parts, no adjustments, no lubrication. An ideal machine for industrial jobs that must run 24 hours a day . . . seven days a week.

No vibration problems, either. And this machine is smaller and lighter than any other machine you can buy. So you can put it on roofs or intermediate floors without heavy foundations. Or put it outdoors. It requires no special housing in mild climates.

The whole system is so simple you don't need highly trained personnel to run it. Our booklet gives you the complete story. Just ask Carrier Corporation, Syracuse 1, New York.



The Carrier Absorption Refrigerating Machine. Available in 115, 150, 200, 270, and 300 ton capacities. Readily adaptable to multi-unit installations.

IDEA-CHEMICALS

... from Du Pont Polychemicals Department

CRYSTAL UREA

helps turn wood waste into building board

In making this new building material, wood waste is bonded with a urea-formaldehyde adhesive and molded into panels under heat and pressure. You can nail these panels, put screws in them, cut them with saws. They have a high insulating value, great structural strength and are resistant to both moisture and fire. Adhesives made with Urea are low in cost. They resist mold, fungus and water and are nonvolatile. They set rapidly at low temperatures and pressures.

Crystal Urea's properties make it a valuable chemical for other industries, too—for example, in pharmaceuticals, finishes, and explosives. And they suggest many new applications. A few possibilities are: as a stabilizer for cellulosic and vinyl plastics, as an intermediate for cosmetics preparation and in fire-resistant electrical insulation.

Your business may find opportunities for profitable future use in Du Pont Crystal Urea . . . or in many of the other Polychemicals products. There are more than 100 of them—organic acids, amides, alcohols, ammonia, esters, resins, solvents and plastics.

Although demand for many of these products now exceeds supply, we will gladly discuss the availability of experimental quantities for developmental work.

Write for technical booklet on Polychemicals products for your industry

Technical bulletins on Crystal Urea and the chemicals and plastics used in your industry are available. Each product bulletin in the booklet presents physical and chemical properties, description, specifications, uses and possible applications, bibliography and other data. Write us on your business letterhead for your copy—and please tell us the name of your industry.

E. I. du Pont de Nemours & Co. (Inc.)
Polychemicals Department, 1510E Nemours Building,
Wilmington 98, Delaware

DU PONT
REG. U. S. PAT. OFF.
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY
Polychemicals
DEPARTMENT
CHEMICALS • PLASTICS

IT'S GOT TO BE *Continuous* TO BE PROFITABLE!

THE STEADY DAY'S WORK OF THE BULLDOZER

Why De Laval?

De Laval has over 70 year's experience in solving problems of separation and clarification. Your problem may be quite similar to one that has already been solved by De Laval centrifugals. It will pay you to ask.

Chemical separation, and clarification, too, should be continuous if it is to be truly profitable. De Laval centrifugal machines take the lost motion out of (1) liquid-liquid, (2) liquid-solid, or (3) liquid-solid-and-liquid separations by making each ***continuous*** by means of centrifugal force. Often De Laval centrifuges will do in seconds work that formerly took minutes by filters or hours by settling. Moreover, De Laval machines will continue to separate at constant efficiency throughout a long run—there is no need to stop to replace vital operating parts, as with some types of filters.

De Laval has many different types of machines that enable each application for centrifugal force to be met exactly. This is essential, for every liquid mixture presents its own problems of specific gravity, viscosity and, in some cases, solids that differ greatly in type and concentration.

Outline your problem to De Laval.

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

De Laval

CONTINUOUS CENTRIFUGAL SEPARATORS & CLARIFIERS

FOR FASTER PROCESSING SYSTEMS

We're making more PHTHALIC ANHYDRIDE...

for Battleships,

Ration Cans

and new

Refrigerators!

The demand for phthalic anhydride—a must in the production of alkyd resins, phthalate esters for plasticizers, dyes, and for many other important uses—has grown at a tremendous rate during recent years. Now, defense needs—for literally scores of war materials—have enormously boosted the already growing need for phthalic anhydride.

Barrett is taking steps to expand with America's defense needs, and to help fulfill civilian requirements as well. Besides increasing capacity at Barrett's Philadelphia and Ironton plants, plans are already under way for construction of new phthalic anhydride plants in Chicago and Philadelphia. The Philadelphia plant is expected to produce 36,000,000 pounds of phthalic anhydride annually. It's a huge order, but it's an order Barrett intends to fill.

* Reg. U. S. Pat. Off.

Barrett*

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

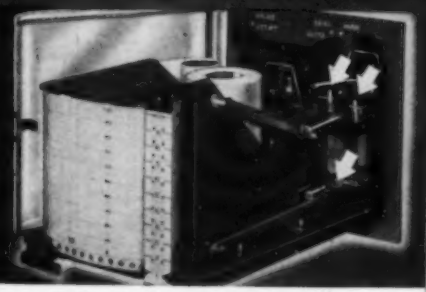
Important Contribution to

Introducing...

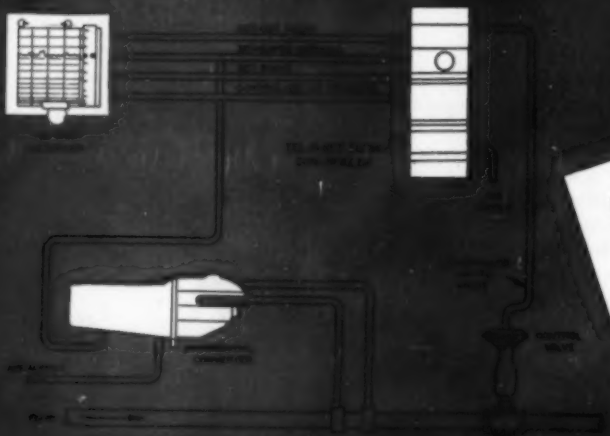
the new TEL-O-SET

8-hour chart visibility without interrupting operations

Built-in adjustable restrictions for pulsating flow



Right side of recorder, illustrating accessibility of zero and fine span adjustments.



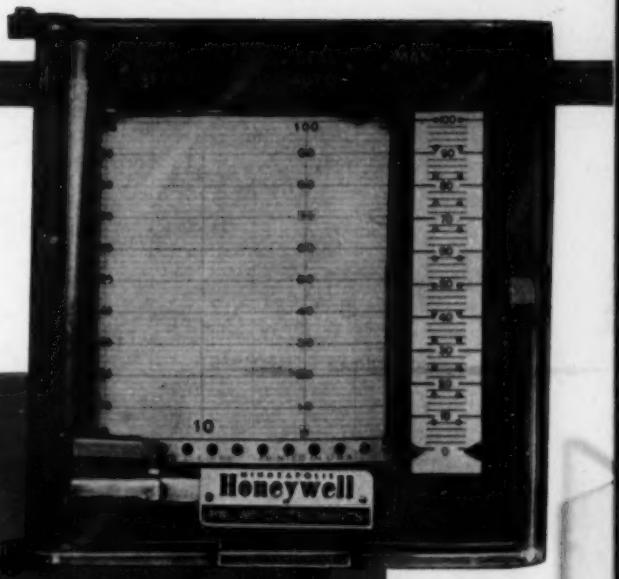
TYPICAL DIAGRAMMED SYSTEM FOR FLOW

The Tel-O-Set Recorder pictured in this diagram is one unit of the complete panel designed and built as an engineered, integrated flow

Requires very little panel space... no holes to drill

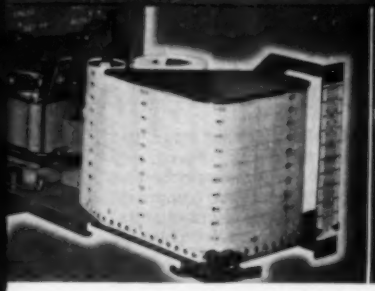
All adjustments made at front of panel

Process Control

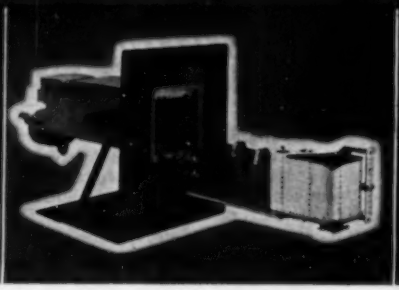


Front view showing transparent plastic cover. Knob at bottom is for adjustment of controller set point when on "automatic," and for regulation of air-to-valve pressure when on "manual." Panel space 5⅛" high by 5" wide.

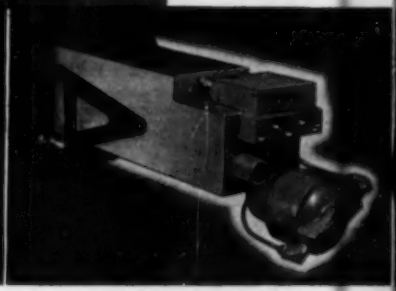
RECORDER



Left side of recorder with chassis partially withdrawn and held by safety catch. Note clearly visible 8-hour chart.



Safety catch released, chassis completely withdrawn from case. Air and electrical connections are still intact.



Rear view, showing one of the two detachable side mounting brackets with its single clamping screw.

The new *Tel-O-Set* Recorder, one of an integrated family of instruments, is used for recording such process variables as temperature, pressure, flow and liquid level. It also provides remote set-point adjustment and valve position indication.

Among the many advantages the *Tel-O-Set* Recorder offers are:

- EASE OF MAINTENANCE. Several models are available —all with interchangeable parts.
- ALL ADJUSTMENTS FROM FRONT OF PANEL. Chassis can be partially withdrawn. Zero, coarse and fine span adjustments, and restriction screws are accessible. Unit is in position for easy chart replacement and pen and ink service.
- FULL 8-HOUR CHART visible by sliding chassis only part way while instrument is still in operation.
- PILOT-OPERATED NON-DRIFT PRESSURE REGULATOR.
- BUMPLESS SHIFTING FROM AUTOMATIC TO MANUAL OPERATION.
- BUILT-IN ADJUSTABLE RESTRICTIONS FOR PULSATING FLOW.

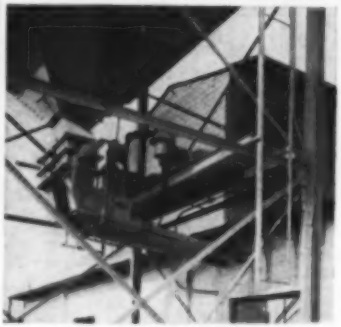
For detailed information, write for Specification No. 769.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4478 Wayne Ave., Philadelphia 44, Pa.

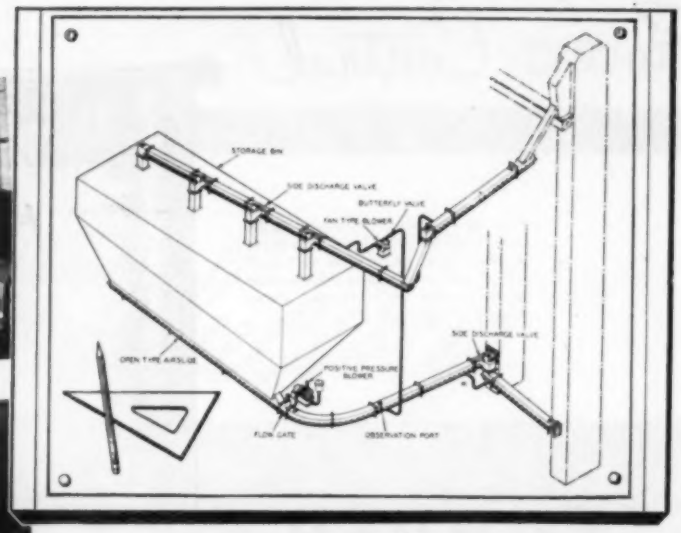
MINNEAPOLIS
Honeywell
Brown Instruments

Conveying from elevator to storage bin underneath floor

Open-type Airslide in bin bottom conveying to elevator



Conveying from storage bin to weigh scales in plant



F-H AIRSLIDE® CONVEYOR you profit by

STARTING FROM SCRATCH

While your modernization program is in the planning stage, get **ALL** the facts about pneumatic conveying of fine, pulverized, and granular materials. Pneumatic conveyors permit economy and convenience in location of buildings and production equipment without the restrictions or straight-line limitations of mechanical conveyors. You'll save time, trouble, and money by pre-planning before installation of your conveying system.

Each job is unique. Each job requires individual study, an individual recommendation of the system best adapted to the purpose. Only specialists in the engineering and building of pneumatic conveying systems are fully equipped to make such recommendations.

Fuller is an organization of specialists in pneumatic conveying systems, and manufactures four basic types of conveyors, each designed to do a particular job in the most efficient and economical manner.

That's why we urge you to avoid possibly wasteful preliminary engineering—why we suggest you let us study your requirements and submit our recommendations, proposal drawings and estimates ***before*** you start construction. There is, of course, no obligation whatsoever.

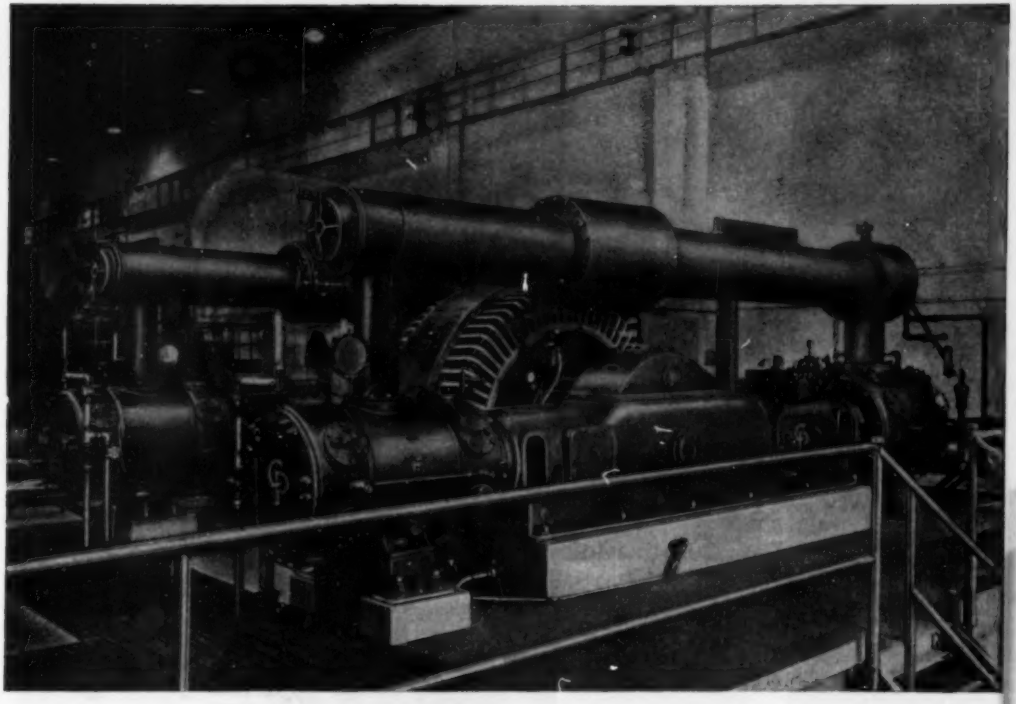
Illustrated is the F-H Airslide, one of the four types of conveying systems we manufacture. It is a revolutionary conveyor, using low-pressure air which fluidizes fine, dry materials so that they flow—by gravity—like water. There are no moving parts—nothing moves but the material.

FULLER COMPANY, Catasauqua, Pa.
Chicago 3—120 So. LaSalle St.
San Francisco 4—420 Chancery Bldg.

Fuller

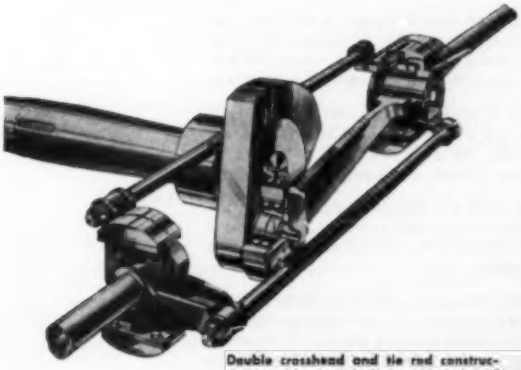
DRY MATERIAL CONVEYING SYSTEMS AND COOLERS · COMPRESSORS AND VACUUM PUMPS · FEEDERS, AND ASSOCIATED EQUIPMENT

FH-23



CP FOUR-CORNER motor-driven compressors

6,000 to 12,000 cfm piston displacement at 100 lbs. pressure



Double crosshead and tie rod construction provides straight-line transmission of power — with only one connecting rod. Roller bearings and crank discs are mounted by the oil injection method.

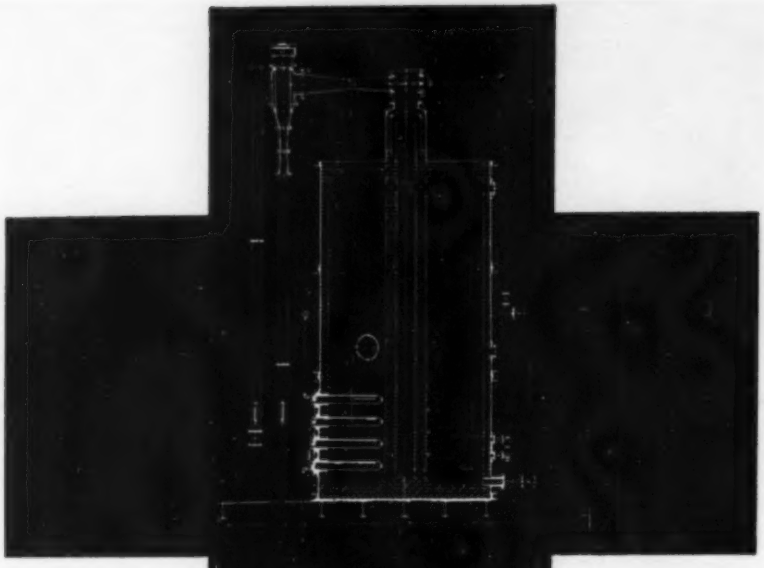
Class H-CE Duplex Synchronous Motor-Driven Compressors have anti-friction roller bearings throughout: spherical roller main and crankpin bearings . . . heavy-duty needle bearings at crosshead pins.

The use of roller bearings in the running gear, and the oil injection system of bearing installation and removal, eliminate all danger of misadjustment in maintenance, and permits the use of one-piece crank disc and solid-end connecting rods — the strongest and safest type.

Write for Bulletin 726-C

CHICAGO PNEUMATIC TOOL COMPANY

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



Here's the *Plus* you get...

...when you recover acid the Simonson-Mantius way

Maybe you're looking into acid recovery as a hedge against rising sulfur prices.

Maybe you're doing it to protect your own and the nation's sulfur supply lines. Or for local reasons.

Whatever your purpose, it will pay you to investigate the Simonson-Mantius Vacuum Process—now in successful use for more than a quarter of a century.

With Simonson-Mantius equipment, you get efficient, economical acid recovery. Acid losses, due to leaks or other factors, are kept to a minimum.

You also get this important S-M plus: fumeless operation. Fumeless because it's effected in closed vessels, under vacuum.

Today, Simonson-Mantius units are efficiently recovering big tonnages of acid in chemical process plants all over the country. And, because of the S-M plus of fumeless operation, these units are also delivering a priceless by-product of goodwill.

Our long and wide experience in solving spent acid problems is yours to draw upon.

NATIONAL LEAD COMPANY
Acid Recovery Department

*Reg. U. S. Pat. Off. *111 Broadway, New York 6, N. Y.*

Down time due to FOUL AIR adds more to your costs...

... than the blower that helps men do a fair day's work

Speed fresh, cool air into a furnace, manhole, tank or other confined area where men must work and you'll get faster, better work in return.

There's a portable, easily adaptable Coppus Blower or Exhauster for just about any problem caused by stagnant, hot or fume-filled air. The Blue Ribbon stands for precision engineering that assures peak performance at lowest cost. Check and mail the coupon today for the information that fits your particular problem. Sales offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in CHEMICAL ENGINEERING CATALOG, REFINERY CATALOG, BEST'S SAFETY DIRECTORY, MINING CATALOGS.

OTHER COPPUS "BLUE RIBBON" PRODUCTS

HORIZONTAL TURBINE
Six frame sizes —
1 to 150 horsepower

VERTICAL TURBINE
Six frame sizes —
1 to 150 horsepower

FANMIX GAS BURNER

FANMIX OIL BURNER

MAIL THIS COUPON To Coppus Engineering Corp. 230 Park Avenue, Worcester 2, Mass.

PLEASE SEND ME INFORMATION ON SUPPLYING FRESH AIR TO MEN WORKING:

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fuselages, wings, etc.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.
- ☐ drying of walls, sheets; etc., after treated with coating material.

NAME .....

COMPANY .....

ADDRESS .....

CITY .....

(Write here any special ventilating problem you may have.)

Jefferson's new chemical { intermediate / stabilizer / plasticizer

NONYL PHENOL

(Formerly Alkyl Phenol C-9)

Properties of Jefferson Nonyl Phenol indicate a wide range of application as

1. an intermediate for non-ionic detergents
2. a stabilizer for ethyl cellulose
3. a plasticizer for cellulose esters
4. an intermediate for other plasticizers
5. a starting material for production of lubricating oil additives and rubber chemicals
6. an antioxidant

A typical description of Jefferson Nonyl Phenol is:

Specific Gravity, 20/4°C	0.949
Hydroxyl Number	255
Color, Pt-Co Scale	200
Refractive Index, 20° C	1.5140
Flash Point (TOC), °F	300
Distillation Range, °C (Modified ASTM)	
IBP	290.0
5 ml.	293.0
50 ml.	295.0
95 ml.	296.5
EP	298.0

You may secure technical information and experimental samples for research and product development by writing (on your company letterhead, please) to our Market Development Division, Dept. G.

A Jefferson ethylene unit (purification section), Port Neches, Texas.

Jefferson Chemical Company, Inc.

711 FIFTH AVENUE, NEW YORK 22, N. Y.

ESSENTIAL CHEMICALS FROM HYDROCARBON SOURCES

ETHYLENE OXIDE
DIETHYLENE GLYCOL
ETHYLENE DICHLORIDE
ETHYLENE GLYCOL

Briefs

From recent literature

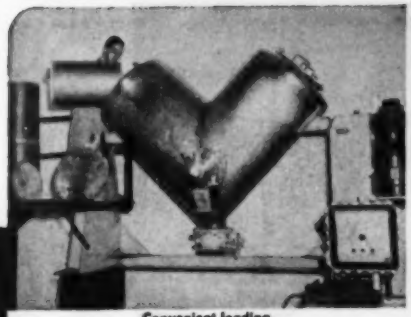
Detergents which exhibit little or no corrosive action on automatic washing machines result when nonyl phenol polyglycol ethers are built with sodium silicates in addition to such materials as phosphates, carbonates, and carboxymethyl cellulose.

Pour Depressers for waxy lubricating oils are formed by acylating nonyl phenol or dinonyl phenol with dibasic acid acylating agents.

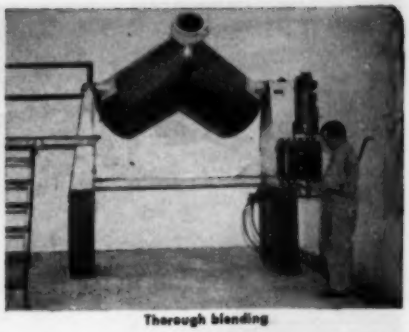
Automobile radiators are cleaned efficiently by employing an emulsion of orthodichlorobenzene and kerosene in strong hydrochloric acid. The emulsion is stabilized with a nonyl phenol polyglycol ether. The cleaner is effective against rust and grease and causes little or no corrosion.

Synthetic waxes suitable for use in greases, polishing compositions, and lubricating oils consist of soluble, fusible nonyl phenol—formaldehyde condensation products which have been reacted with higher fatty acids.

These developments are abstracted from recent publications or U. S. patents. They may suggest other applications of Jefferson Nonyl Phenol in your products or processes.

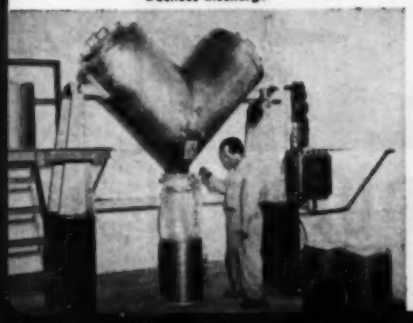


Convenient loading



Thorough blending

Dustless discharge



Easy cleaning

SAVES TIME PROMOTES UNIFORMITY for GANE'S chemicals

When executives of Gane's Chemical Works, Inc., Carlstadt, N. J., witnessed a laboratory test of the p-k Twin Shell Dry Blender, they were immediately impressed by its possibilities. Now—a 20-cu. ft. stainless steel blender is in constant operation, blending phenobarbital and similar drugs where no variation in lot batches can be tolerated. The p-k Twin Shell requires an average of only 10 to 15 minutes for a complete blend to absolute uniformity as compared with from 4 to 5 hours previously required in other blending equipment, without guarantee of uniformity.

Loading and discharging time has been reduced—cleaning is simplified by the smooth polished interior surface and absence of baffles in the p-k Blender. p-k Twin Shell Blenders mix dry materials faster and more uniformly than any other blender. Operating capacities range from 1 to 250 cubic feet; speeds from 6 to 29 rpm.

p-k will be glad to run an experimental blend of your materials to demonstrate timing for thorough blending. There is no obligation—and the results will introduce you to an entirely new and widely accepted method of dry blending.

Send for Catalogs 401 and 402 for further information on both the laboratory and production models.

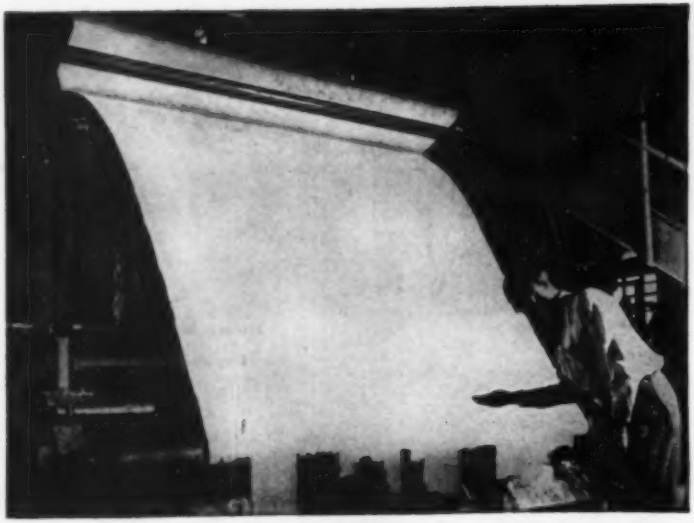
Mixers • Coolers • Kettles • Agitators
Nitrators • Reboilers • Autoclaves
Condensers • Evaporators • Sulfonators
Brine Heaters • Brine Coolers
Freon Coolers • Soap Crutchers
Ribbon Blenders • Fuel Oil Heaters
Vapor Condensers • Lube Oil Coolers • Lube Oil Heaters • Reaction Vessels • Instantaneous Heaters
Quenching Oil Coolers • Storage Heaters
Refrigerant Condensers • Twin Shell Blenders*
*Patented

the Patterson-Kelley Co., Inc.

22 Lackawanna Ave. East Stroudsburg, Penna.

1011

301 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16



HIGHER PRODUCTION RATES

Continuously

WITH FEinc STRING FILTERS

Because they make filtration a *really* continuous process, FEinc rotary vacuum filters consistently turn in records of increased production with lower costs, better quality.

For example:

Removing sulphates from a heavy, gelatinous cake required nine separate stages of filtering on an ordinary rotary vacuum filter. FEinc produced the same result in only five stages, increased production almost 100%.

Two scraper type filters handling black iron oxide were replaced by one FEinc of same size. Scrapers partially blinded cloth, gave wet mud due to blowback of filtrate into cake. FEinc, with washing mechanism, gives clean, dry cake, keeps cloth open for efficient filtering. No blowback, either.

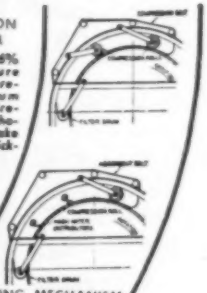
Scraper filter handling calcium carbonate gave wet cake, had low capacity. Cloth life never exceeded 30 days. Switching to FEinc String Discharge and FEinc Compression Dewatering Mechanism eliminated *scraper* wear, permitted use of lighter, more efficient cloth. Filtrate was clearer, cake pick-up better, and cloth lasted 50% longer!

Send for free bulletin 103!

FAMOUS FEinc PRODUCTION-BOOSTING FEATURES

COMPRESSION MECHANISM

Removes 2 to 6% more moisture from cake, reduces vacuum power requirements, gives homogeneous cake of uniform thickness.



WASHING MECHANISM

Wash water applied through absorbent belt submerges cake, displaces mother liquor to give clean cake with minimum moisture, more complete recovery of solubles.

STRING DISCHARGE

Cake builds up on continuous strings which lift it from drum in a continuous sheet. No smearing, blinding, or plugging of cloth.

FILTRATION ENGINEERS INC.

155 ORATON STREET · NEWARK 4, NEW JERSEY

Naugatuck
ROYAL FAMILY OF PLASTICS

marvinol rigids put a new product future in your hands

Do you need new **color and lasting beauty for the products you manufacture?**

See what one of Naugatuck's Marvinol Rigids has done with a protective covering for steel tubing. We think that this product—with its resistance to abrasion, corrosion, and flame—will interest you.

The plastic armor Marvinol has created here is called Dekoron®. It is a product of Samuel Moore & Co., Mantua, Ohio. You'll soon see it on stanchions, overhead rails, and seat grab rails of busses. There it sheathes common metals and improves their performance, feel, and appearance—makes them real passenger pleasers.

This Marvinol-based Dekoron comes in brilliant colors which are solid through and through. Their delightful, easy-to-clean color and beauty *will never wear off.*

With the new eye appeal of this Marvinol Rigid, you also get improved structural strength. Neither dirt nor perspiration can harm it. And it feels warm in cold weather, cool in warm weather. Here is highest product quality—*at no premium in cost!*

Of course, there are hundreds more ways to use Marvinol vinyl resins—in rigids, films, sheet, or sponging.

These versatile Marvinol resins—quick to process, uniform in quality—come to you from Naugatuck Chemical. Write on your company letterhead for the facts on Marvinol to the address below.

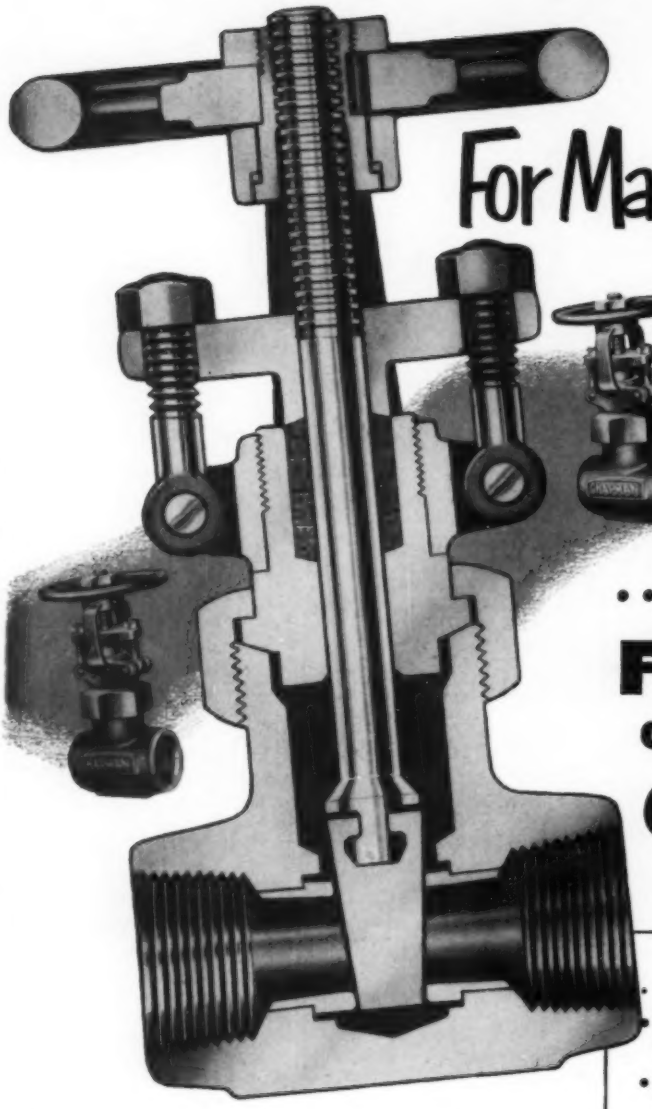
Naugatuck Chemical Division of UNITED STATES RUBBER COMPANY

209 ELM ST., NAUGATUCK, CONNECTICUT

BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • New York • Philadelphia • IN CANADA: Naugatuck Chemicals, Elmira, Ontario

MARVINOL® vinyl resins • KRALASTIC® styrene copolymers • VIBRIN® polyester resins

Rubber Chemicals
Aromatics
Synthetic Rubber
Agricultural Chemicals
Reclaimed Rubber
Latices



For Many Services

. . . Use this same

FORGED GATE VALVE

CHAPMAN LIST 960

. . . In these different alloys

- Carbon steel forgings with stainless steel (12-14 chrome) trim.
- Stainless steel (12-14 chrome) forgings with stainless steel (12-14 chrome) trim.
- Stainless steel (18-8) forgings and stainless steel (18-8) trim.
- Alloy steel (4-6) chrome body forgings with stainless steel (18-8) or Cyclops trim.

To all the many jobs for which it's qualified, Chapman List 960 brings *extra* wear-resistance in exclusive features like these:

Extra strength of stem-and-wedge gate connection provides protection against even unusual service stress.

Super-hardened seat rings and wedge-faces of stainless steel.

Bolted Follower with no follower threads on yoke to corrode. Follower easily tightened down any time when necessary.

List 960 comes in sizes from ¼" to 2". Joints either gasketed or metal-to-metal. Two types: Rising stem with yoke (shown), or rising stem with inside screw. Pressure range: 2000 lb. at 100°F.—380 lb. at 1000°F. (For higher pressures, specify List 990.) Send for illustrated bulletin on List 960.

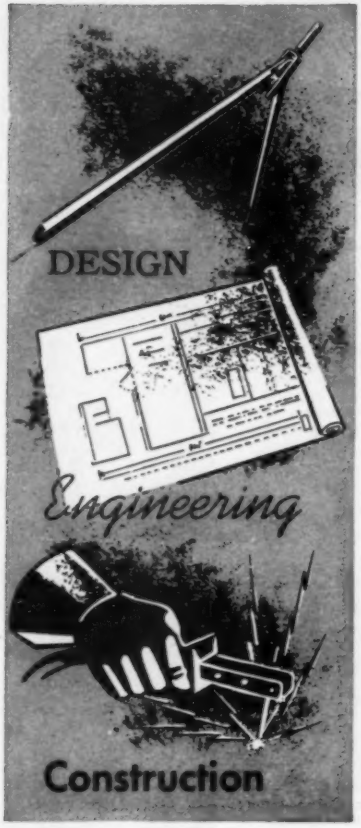
The CHAPMAN Valve Manufacturing Company

INDIAN ORCHARD, MASSACHUSETTS

Pritchard

DESIGN
ENGINEERING
CONSTRUCTION

Outstanding Experience



Your Assurance of a Profitable Chemical Plant

The training...the widely diversified experience of chemical engineers in Pritchard's Chemical Division are your assurance of a successful, profitable chemical plant. Pritchard engineers have an intensive knowledge of various processing industries and the specific unit operations involved in each.

Just a few of these many unit operations are:

- Processing and handling of gases, liquids and solids
- Evaporation
- Crystallization
- Filtration
- Absorption
- Heat Transfer
- Fractional Distillation

Pritchard Services Are Flexible to Meet Your Needs

If you desire turnkey service, Pritchard offers a *Single Responsibility Contract.* Or you may call upon Pritchard to work with and supplement your own permanent staff. This plan relieves you of the extra work load of new plant or unit design, engineering, procurement or construction. Pritchard stands ready to serve you in any way...as your project may require.

We invite your specific inquiry

Chemical Division
Power Division
Petroleum Division
Natural Gas Division

NATIONAL WELDING INSPECTORS ASSOCIATION MEMBER

J.F. Pritchard & Co.

DESIGN · ENGINEERING · CONSTRUCTION

Dept. No. 195 — 908 Grand Ave., Kansas City 6, Mo.

Pritchard Offices: CHICAGO · HOUSTON · NEW YORK · PITTSBURGH

CROUSE-HINDS High Efficiency LIGHTING EQUIPMENT . . .

Type EVF Explosion-Proof and Dust-Tight Fluorescent Lighting Fixtures 1, 2, 3, or 4 -Lamp

. . for Hazardous Locations

Crouse-Hinds explosion-proof lighting fixtures exceed the requirements for service in highly explosive atmospheres. They are designed to operate at a temperature below the ignition temperature of the gas-air or vapor-air mixture. They are so strong that they will resist internal explosions without damage and so tight that they will prevent the escape of flames or burning gases which might ignite the surrounding atmosphere.

Crouse-Hinds dust-tight lighting fixtures assure safety in locations that are hazardous because of the presence of combustible dust.

. . . for Wet and Corrosive Locations

Crouse-Hinds vaportight lighting fixtures are ideal for use in boiler rooms, powerhouses, shower rooms, tunnels, loading docks, building entrances, and all indoor and outdoor locations where exposed to moisture and rain, non-explosive vapors and gases, or non-combustible dusts.

Hundreds of industrial lighting fixtures are listed in Crouse-Hinds Condulet Catalog.

. . . for Protection

Sabotage thrives in darkness. The most reliable and cheapest form of protection against night prowlers is LIGHT! Crouse-Hinds floodlights project powerful beams of light that bathe all approaches to your property with glaring radiance, killing darkness and shadows and compelling everyone to be more visible at night than in broad daylight.

The protective power of light should be used in all important municipal and industrial locations. The floodlighting of industrial plants serves a double purpose. It helps to boost production in addition to the security it provides.

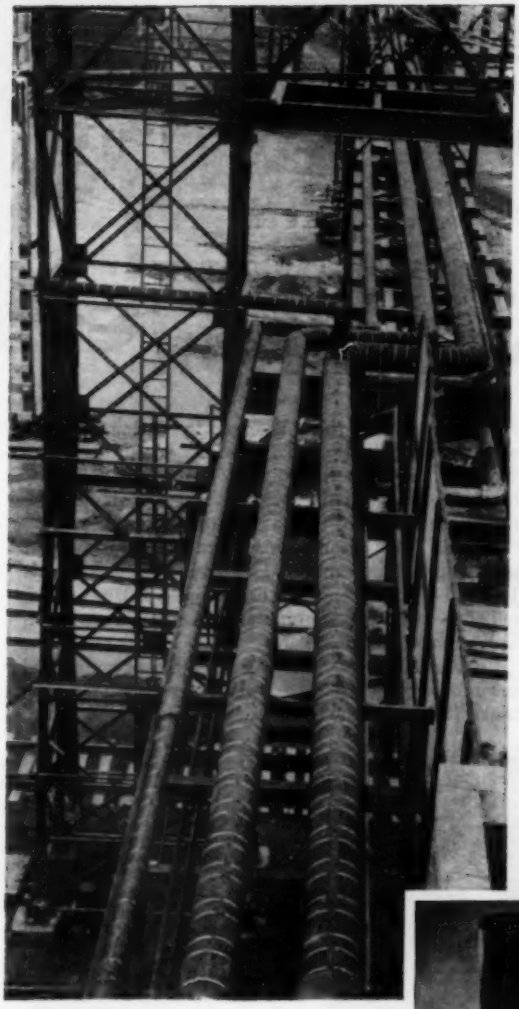
Send for your copy of Bulletin 2565, "LIGHT! Protect Your Property."

A Nationwide Distribution Through Electrical Wholesalers

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

Offices: Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas Denver — Detroit — Houston — Indianapolis — Kansas City — Los Angeles — Milwaukee Minneapolis — New York — Philadelphia — Pittsburgh — Portland, Ore. — San Francisco Seattle — St. Louis — Washington. *Resident Representatives:* Albany Atlanta — Baltimore — Charlotte — New Orleans — Richmond, Va.
CROUSE-HINDS COMPANY OF CANADA, LTD., TORONTO, ONT.

CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS



WHICH PIPE NEEDS FOAMGLAS MOST?

● As these fuel oil and steam lines at the Warners, N. J. Plant of American Cyanamid Company must be kept at temperatures of 190° to 390° Fahrenheit, they *all* have a big need for their factory-wrapped FOAMGLAS.

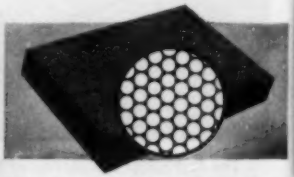
FOAMGLAS — indoors or outdoors — insulates equally well from below zero temperatures to 800°F. It retains its effectiveness. It's light, rigid, durable.

For use on pipe lines of standard sizes, FOAMGLAS is available in two types, "Regular" and "Factory-wrapped." The latter—covered with a glass cloth membrane—is most widely used for temperatures from 212°F. to 800°F., but also can be used for cold applications.

Get the latest information about FOAMGLAS for piping, valves and fittings, tanks and towers, heat exchangers, evaporators and other process equipment. Write for sample and free copy of booklet.

PITTSBURGH CORNING CORPORATION
PITTSBURGH 22, PA.

Factory-wrapped pipe insulation comes with a ready-made finish that may be painted if desired. The FOAMGLAS sections are placed on the pipe, wired or banded, and the flaps then cemented over the longitudinal and end joints respectively. Piping and fitting insulation is fabricated to close tolerances to insure close fit with the equipment and to provide full thickness of insulation. ▶



The best glass insulation is cellular glass. The only cellular glass insulation is FOAMGLAS. This unique material is composed of still air, sealed in minute glass cells. It is light weight, incombustible, verminproof. It has unusually high resistance to moisture, chemicals and other elements that cause insulation to deteriorate.

PITTSBURGH PC CORNING

FOAMGLAS® *the cellular glass insulation*

When you insulate with FOAMGLAS . . . the insulation lasts!

Pittsburgh Corning Corporation
Dept. CC-101, 307 Fourth Avenue
Pittsburgh 22, Pa.

Please send me without obligation, a sample of FOAMGLAS and your FREE booklet on the use of FOAMGLAS for Piping and Process Equipment.

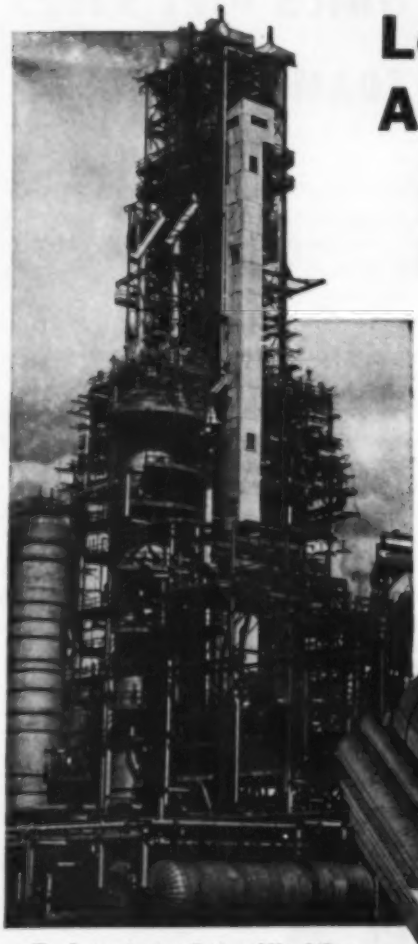
Name.....

Address.....

City.....State.....

Another Example of the Trend...

Leading Refiners Are Switching to KAYLO HEAT INSULATION



The first major installation of Houdriflow "cat" crackers — a 308-ft. quadruple-reactor catalytic cracking unit — Sun Oil Company's Plant 5 at Toledo, Ohio. The entire catalyst system is insulated with Kaylo Heat Insulation.

Never before has there been an insulating material with the combination of important advantages provided by Kaylo Heat Insulation. More and more it is becoming recognized throughout industry as the first major advancement in the high-temperature field.

Kaylo Heat Insulation is a calcium silicate (not glass), an inorganic material with remarkable stability. Its high effective temperature limit—1200°F.—eliminates the need for combination covering in nearly all operating conditions.

Kaylo Heat Insulation is insoluble in water and incombustible. Its light weight and high strength make it easy to handle and apply.

KAYLO PIPE INSULATION is made to Simplified Dimensional Standards of thicknesses and diameters. Coverings are sectional for tube and pipe sizes ¼" to 12"; tri-segmental up to 23"; quad-segmental up to 41"; K-segmental (18" wide segments) up to 72" in diameter.

KAYLO HEAT INSULATING BLOCK is made in all standard sizes and thicknesses from 1" to 6" for flat surfaces and for vessels larger than 60' in diameter; curved block 18" wide for smaller vessels.

For complete details on Kaylo Heat Insulation, write Dept. N-182, Owens-Illinois Glass Company, Kaylo Division, Toledo 1, Ohio.

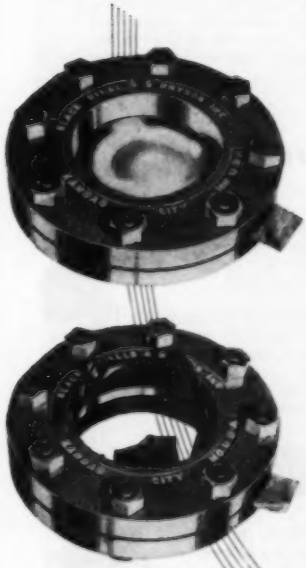
KAYLO. . . *first in calcium silicate*

...pioneered by OWENS-ILLINOIS Glass Company

MAIN OFFICE: TOLEDO 1, OHIO—KAYLO SALES OFFICES: ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND DETROIT • HOUSTON • MINNEAPOLIS • NEW YORK • OKLAHOMA CITY • PHILADELPHIA • PITTSBURGH • ST. LOUIS • WASHINGTON

Through the years, BS&B has built a large, complete inventory of rupture disc metals. Of even greater value than its intrinsic worth is BS&B's exact knowledge of its characteristics under pressure.

Here Is Your Key to Pressure Protection!



SAFETY HEAD diaphragm burst by over-pressure. Note full discharge opening.

● There is a SAFETY HEAD to do the job...whether your medium is gas or liquid, corrosive or bland, high temperature or low. Research and long years of exclusive manufacture have enabled BS&B to control such rupture disc metals as aluminum, copper, monel, nickel, inconel, silver and platinum.

Instant action...full pipe-size, unrestricted opening occurs immediately after disc rupture. SAFETY HEADS may be employed as the sole relief device... as a secondary relief...beneath relief valve to prevent leakage or to protect valve parts...and at the relief valve outlet. If you have equipment under pressure, *you need SAFETY HEADS!*

Write today for catalog . . . ask about free analysis of your pressure problem.

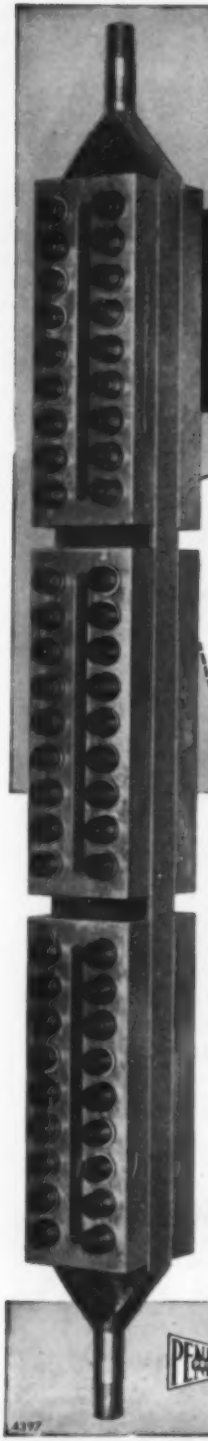
BLACK, SIVALLS & BRYSON, INC.
Adv. Dept. Rm. 47N 7502 East 12th Street
Kansas City 3, Missouri

SAFETY HEADS
for
Positive Pressure Protection

for operating pressures up to

10,000 psi

PENBERTHY transparent LIQUID LEVEL GAGES



Another PENBERTHY First

Patent Applied for

These gages were developed by Penberthy in answer to persistent demands from the process industries and various laboratories for a gage with UNOBSTRUCTED VISIBILITY at service pressure ratings up to 10,000 psi. They are tested to 15,000 psi. Temperature rating is 250° F dry gas . . . 300° F wet gas.

In addition to their value as liquid level indicators, these gages are useful as reaction chambers, equilibrium cells, high pressure manometers, etc.

The standard gage body containing the liquid chamber is forged carbon steel but stainless steels are available. Design is such that glass is entirely relieved of boiling pressure . . . providing a better seal and avoiding those stress concentrations which cause so much glass breakage.

These Penberthy 10,000 psi gages are of proven dependability . . . they have been in field service for more than two years. Write us regarding your requirements.

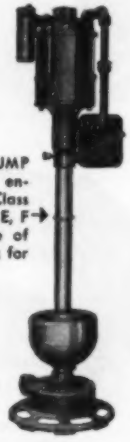
OTHER PENBERTHY PRODUCTS

PENBERTHY REFLEX GAGE. Empty space shows white, liquid shows black. You can't misread. Available in special alloys and now available for operating pressures up to 5,000 psi. Ask for Catalog 35.

PENBERTHY CYCLING JET PUMPS. Automatically operated by air, gas or steam pressure . . . Will pump without clogging any liquid that will flow through pipes. Ask for Bulletin 5030.

PENBERTHY EXPLOSION-PROOF SUMP PUMPS. Motor and switch totally enclosed. Underwriter approved for Class 1, Group D, and Class 2, Groups E, F and G hazardous location. Made of copper and bronze throughout. Ask for Bulletin 4929.

PENBERTHY EJECTORS. A simple jet pump operated by air, water or steam. Needs no lubrication . . . will not get out of order. Ask for Bulletin 5080.



PENBERTHY ALSO MANUFACTURES A COMPLETE LINE OF LIQUID LEVEL GAGES IN BRONZE, IRON, STEEL AND ALLOYS

PENBERTHY INJECTOR COMPANY

DIVISION OF THE BUFFALO-ECLIPSE CORPORATION

DETROIT 2, MICHIGAN

Established 1886

Canadian Plant: Windsor, Ontario

4397

ENGINEERING News

SK ROTAMETERS HELP PROVIDE CLOSE CONTROL IN VITAMIN A PROCESSING

(PHOTOS AND STORY BY COURTESY OF CHAS. PFIZER & CO., INC.)

On March 19, 1951, Chas. Pfizer & Co., Inc., 102-year-old Brooklyn chemical firm, announced that stabilized crystalline Vitamin A Acetate was being produced by synthesis on a commercial scale for the first time in history.

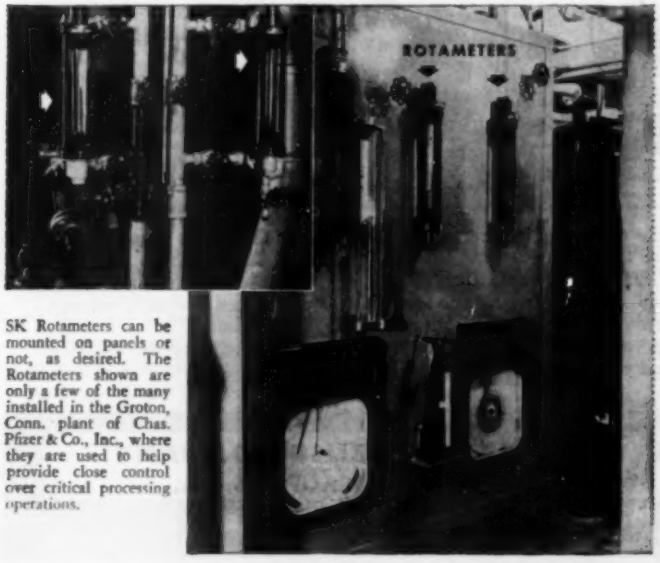
Production of Vitamin A is being accomplished at the company's new two-million-dollar plant in Groton, Conn. which, when operating at full capacity, will be able to produce 50% of the U. S. need for this vitamin.

In this new plant, a large number of SK Universal Rotameters, accurate fluid rate-of-flow measuring instruments, are being used to help provide close control over critical processing operations.

SK Rotameters offer an ideal solution to many flow metering problems. They are not complicated in design—their principal components include a calibrated glass tube, a rotor, and a sturdy metal frame and end fittings. The gas or liquid being metered passes through the Rotameter tube from bottom to top. The rotor moves up or down in the tube as the rate of flow increases or decreases. Rate of flow is determined by reading the location of the top of the rotor against the uniform, etched calibration marks on the glass tube.

Many fluid metering problems can be solved with the Universal type shown in the photos. However, many other types are available for measuring, recording, integrating, or controlling fluid flow.

For information on all types of SK Rotameters, request Bulletin 18-RA.



SK Rotameters can be mounted on panels or not, as desired. The Rotameters shown are only a few of the many installed in the Groton, Conn. plant of Chas. Pfizer & Co., Inc., where they are used to help provide close control over critical processing operations.

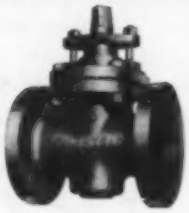
SK Steam Jet Slurry Heaters offer an efficient and economical method for heating grain, mash, starch slurry, or for pumping semi-solids in chemical processes. They are easy to install, need practically no supervision, are quite easy to maintain since they have no moving parts to get out of order. Used in many continuous process operations, they are saving many manufacturers money.

For details, request Bulletin 3-A.

SCHUTTE and KOERTING Company
Manufacturing Engineers
CORNWELLS HEIGHTS
BUCKS COUNTY, PA.

WE MAKE *ALL* TYPES OF PLUG VALVES
. . . including the *right* one for *your* needs

HOMESTEAD CAM-SEAL



Straight-way—
Flanged or Screw Ends

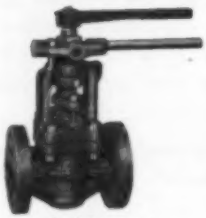
Three-way—Screw or Flanged Ends

Four-way—Flanged or Screw Ends

HOMESTEAD CAM-SEAL, QUARTER-TURN PLUG VALVES
(non-lubricated, or pressure-gun lubricated, as desired)

Available in metals for most valve needs; for pressures to 3,000 lbs.; temperatures to 750° F.

HOMESTEAD LEVER-SEALD



Straight-way—
Flanged or Screw Ends

Three-way—Flanged or Screw Ends

Four-way—Flanged or Screw Ends

HOMESTEAD LEVER-SEALD, QUARTER-TURN PLUG VALVES
(non-lubricated, or pressure-gun lubricated, as desired)

Made in combinations of metals and alloys to meet practically any service requirement; from 1½" to 10", from vacuum to 1,500 pounds.

HOMESTEAD-REISER

Straight-way—
Screw or Flanged Ends

Straight-way—
Worm & Gear Operated

Flow-Changer—Non-lubricated

HOMESTEAD-REISER SELF-SEALD LUBRICATED PLUG VALVES
(100% Port Area, or Venturi, as desired)

Available in semi-steel; cast steel; sizes ½" to 12" for steam pressures to 150 lbs.; oil-water-gas to 200 pounds.

We are the only manufacturer who makes *all* of the various types of plug valves used in industry . . . LUBRICATED . . . NON-LUBRICATED . . . FULL PORT . . . VENTURI. We have no "leaders." *We make them all;* therefore, we have no reason to "push" one type valve over another. Our only concern is to see that you get the *right* valve for *your* requirement.

To help you keep this in mind the next time you need plug valves, we'd like to send you our catalog. Why not write for it today.

HOMESTEAD VALVE MANUFACTURING COMPANY
P. O. BOX 13 CORAOPOLIS, PA.

Serving since 1892

—HELPS CHEMICAL INDUSTRIES THRIVE!

Ion Exchange Applications Permit Many New and Improved Processes

● **Removal of acids** from aqueous and non-aqueous solutions. Permutit has four types of anion exchangers available for acid removal and anion exchange, one for any type of process conditions.

● **Purification of organics.** The Permutit Demineralizing Process has been used commercially for purifying polyhydric alcohols, sugars and fine chemicals.

● **Recovery of metals.** Permutit cation and anion exchangers are being used for removal and concentration of valuable metals such as copper, zinc and precious metals in wastes and process solutions. Permutit has four types of organic cation exchangers and two inorganic cation exchangers.

● **Recovery of acids.** Permutit has developed processes for removing metals from strong solutions of weak acids or dilute solutions of strong acids. *Permutit Q* is being used, for example, for purifying phosphoric acid pickling solutions and chromic acid anodizing baths. Dilute acids may readily be concentrated.

For further information, write for free bulletin to The Permutit Company, Dept. CN-10, 330 West 42nd Street, New York 18, N. Y., or to Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal.

PERMUTIT®

WATER CONDITIONING HEADQUARTERS FOR OVER 30 YEARS . . .

ION EXCHANGE HEADQUARTERS FOR YEARS—AND YEARS TO COME

CHECK ALL THESE FEATURES . . .

. . . and you'll appreciate why there are more **LimiTorque®** *Automatic Valve Controls in use, than all others.*

1. **Micrometer torque seating switch.**
2. **Self contained unit—no gears, nut or bearings to buy.**
3. **Weatherproof, dust-tight and watertight construction.**
4. **Hammerblow device.**
5. **Non-rotating handwheel built into the unit.**
6. **Automatic declutching.**
7. **Motor is disengaged during handwheel operation.**
8. **Can always be declutched for handwheel operation regardless of weather or electrical conditions.**
9. **High torque motors.**
10. **Simple valve yoke.**
11. **May be mounted in any position.**
12. **Three to four times faster handwheel operation.**

This Unit is mounted on top of valve yoke . . . Stem nut is inside and furnished with LimiTorque Unit. Nut is directly inside worm gear which drives it. (All clutches and connecting sleeves are eliminated.)

The LimiTorque is designed for plug, butterfly, gate and globe valves up to 96" diameter . . . Entire Unit and nut can be lifted off valve yoke, by removing flange bolts.

A special high starting torque motor, reduction gears, limit switches are all in one weatherproof assembly—and all electrical connections are made to terminal boards, easily accessible by removal of watertight cover . . . heat treated helical gears and hardened, ground and polished worm and bronze worm gear are used.

The usual Limitorque "hammerblow" device allows motor to reach full speed before load is engaged. This imparts the "hammerblow" necessary to unseat sticking valve.

Torque seating switch insures tight valve closure without strain on valve parts. Protection from damage due to a foreign object obstructing closing is provided during entire closing operation because motor is shut off by thrust exerted on valve disc.

Actuation may be by any available power source such as electricity, air, oil, gas or water.

Write for Catalog L-50 for complete details. Please use your Business Letterhead.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

paper sculpture by gerstein-agan

EFFICIENCY IS INHERENT

in NIALK* chemicals, because they are processed for highest purity and uniformity...to give best results in your processes.

NIALK	Liquid Chlorine
NIALK	Caustic Potash
NIALK	Carbonate of Potash
NIALK	Paradichlorobenzene
NIALK	Caustic Soda
NIALK	TRICHLORethylene
NIAGATHAL*	(Tetrachloro Phthalic Anhydride)

*Trade-mark

NIAGARA ALKALI COMPANY

60 East 42nd Street, New York 17, N. Y.

HIEROGLYPHICS ... *with a modern meaning*

The workman of ancient Egypt knew the symbols of his trade. They helped him fashion stone and metal, wood and cloth, into the goods and structures which best served his era. . . . The needs of our modern industrial civilization are different. Visitors to Sun Ship's mighty shops see in the making the intricate steel fabric of petroleum refineries and chemical plants . . . massive bubble towers, pressure vessels, condensers, cracking cases, and a vast array of special machinery and equipment for many industries.

But even a visitor from the days of Egypt's Pharaohs would recognize two familiar facts — that strange modern "hieroglyphics" guide precise assembly of today's steel behemoths . . . and that Sun Ship workers are masters in their knowledge of the symbols and crafts of their trades. . . . The many modern industries served by Sun know these facts, too.

Illustration at top, reproduced from "The History of All Nations," shows ancient Egyptian shipbuilding as depicted on the tomb of Ti, at Sakkara. In contrast is the 55' regenerator being built by Sun.

Sun

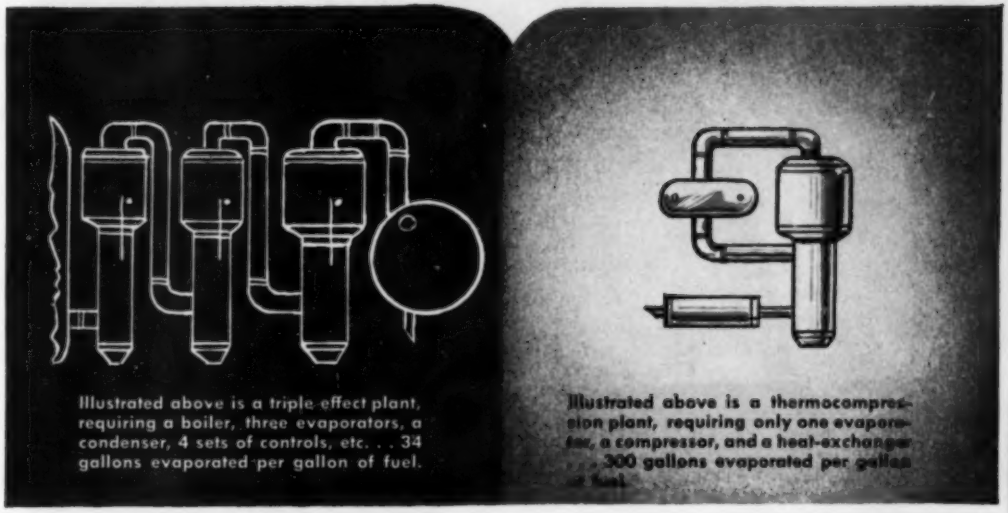
SHIPBUILDING & DRY DOCK COMPANY

SINCE 1916

ON THE DELAWARE • CHESTER, PA.

25 BROADWAY • NEW YORK CITY

The difference between Night and Day



Illustrated above is a triple-effect plant, requiring a boiler, three evaporators, a condenser, 4 sets of controls, etc. . . 34 gallons evaporated per gallon of fuel.

Illustrated above is a thermocompression plant, requiring only one evaporator, a compressor, and a heat-exchanger . . . 300 gallons evaporated per gallon of fuel.

with MECO THERMOCOMPRESSION EVAPORATORS

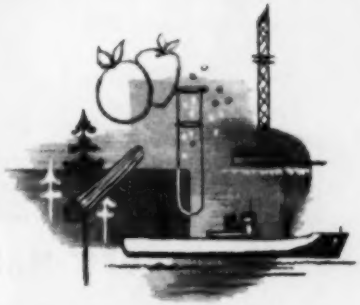
lower cost — much greater efficiency!

LOWER FUEL COST

No matter what the job is—evaporation for concentration or distilled water production—you will find that MECO thermocompression evaporators do the job better at less cost! For instance, one MECO unit is equivalent in efficiency to a *27 effect*, multiple effect conventional plant . . . can make *pyrogen free*, chemically pure water.

LOWER OPERATION & MAINTENANCE COST

The higher the efficiency, the fewer the components, the more simple in principle the machine is—the less the cost of operation! Our brochure will describe principles of MECO thermocompression evaporation and the reasons why it will keep the operating cost of your job down, way down! MECO's working parts are so few and so easy to keep up that an average mechanic can do it with ease. High quality design insures long life.



Sea water for distillation for the oil industry . . . Concentration for the Chemical industry . . . uses in the paper, fruit juice and many other industries.

MECO

MECHANICAL EQUIPMENT CO., INC.

NEW ORLEANS, LOUISIANA

This equipment is built under various patents belonging to Mechanical Equipment Company, and Arthur D. Little, Inc.

MECHANICAL EQUIPMENT CO., Inc.
861 Carondelet St.
New Orleans, La.

Please send me bulletin concerning MECO thermocompression evaporation units.

Name _____

Address _____

..."doing a fine job"

STANCO SALT

PLANT ON U. S. HWY. 40
W. OF GRANTSVILLE, UTAH

STANSBURY SALT COMPANY, INC.
408 ZION'S SAVINGS BANK BLDG.—PHONE 7-0834
SALT LAKE CITY 1, UTAH

June 16, 1951

Standard Steel Corporation
5001 Boyle Ave.
Los Angeles 58, Calif.

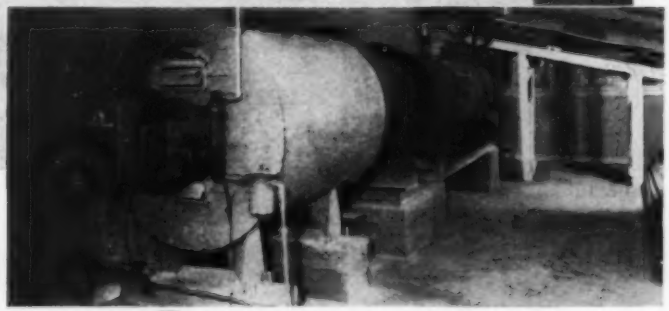
Gentlemen:

The 3-1/2 ton per hour capacity Monel salt dryer, which your company fabricated for us last year, is operating at full capacity in a very satisfactory manner. The thermal efficiency is high and our cost of operation including fuel and electricity is low.

We are pleased with the equipment and it is doing a fine job.

Yours truly,
STANSBURY SALT CO., INC.
A. Z. Richards Jr

AZR/dw



Another STANDARD HERSEY PROFIT-MAKING *Dryer* INSTALLATION

From operators throughout the country come letters such as the one above—convincing confirmation that Standard-Hersey Dryers are really "doing the job".

The Stansbury Salt Company installation is a routine example of the satisfaction owners may expect from Standard-Hersey equipment. At Standard, an unequaled fund of dryer experience dating back to 1880 is combined with the most advanced engineering and fabricating technique to assure you top value for your dryer dollar.

More than 30 types of Standard-Hersey dryers are available in all commercial sizes for every process industry need.

STANDARD HERSEY *Dryers*

SEND FOR NEW 12 PAGE DRYER BULLETIN

Complete illustrated brochure describes advantages and features of Standard-Hersey Dryers, Kilns, Coolers and Calciners; tells operation of Standard-Hersey "pilot" dryer for pre-testing your product. *Write for Bulletin No. 508.*

STANDARD STEEL CORPORATION

5085 Boyle Ave., Los Angeles 58 ★ 123-5 Newbury St., Boston 16

Non-metallic melting? LECTROMELT* has the answers!

Designed to solve your production problems—

For smelting and refining operations, so many variables enter into each problem that Lectromelt plans your furnace or furnace components to meet specific requirements. Electrode controls, for example, are designed for the individual installation. Automatically or manually operated, they make possible finely accurate adjustments.

Built to keep you in production—

Because they're built for long, low-cost operation. Rugged construction is combined with micro-accurate control. Electrical equipment and substations are built to withstand tremendous overloads.

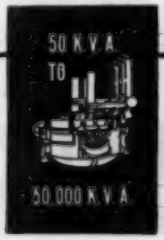
More than a million and a half kilowatts of installed capacity promise that Lectromelt engineers have the answer to your smelting problems. Write for our booklet to Pittsburgh Lectromelt Corporation, 325 32nd Street, Pittsburgh 30, Penna.

Write for your free copy of Lectromelt's booklet, "Moore Rapid Lectromelt Furnaces for Smelting and Refining Operations."

*REG. T. M. U. S. PAT. OFF.

MOORE RAPID

WHEN YOU MELT... *Lectromelt*



HERCULES CARBOY BOXES

GIVE YOU EXTRA PROTECTION!

PROMPT DELIVERY

You get extra protection from these rugged, all wood carboy boxes due to their sturdy, patented construction . . . with interchangeable cork (Hercules) or rubber cushion (Aero) inserts and cushions. That's why they stand up under the rough-and-tumble of regular usage and save you both time and money by reducing bottle breakage, repairs and replacements. For the best carboy boxes possible . . . contact National!

6½-GALLON CARBOY FEATURES

Built to withstand an internal pressure of 10 lbs. this completely enclosed wooden carboy, with interchangeable cork or rubber cushion inserts and cushions, complies with I.C.C. 1-D regulations for the transportation of mineral acids. Specific application should be made for other uses.

1. Flat cover — no protruding neck—enables boxes to be piled on top of each other for convenient, compact storage.
2. Corner posts provide a convenient handle so that one man can handle the carboy.
3. Small size and light weight provides for easier handling and shipping.
4. Regulation Polystyrene cap supplied.

Complies with classification I.C.C. 1-D

13-GALLON CARBOY FEATURES

1. All-point protection reduces bottle breakage to a minimum—both in loading and transit.
2. Reduces occupational hazards since safety from breakage minimizes danger of acid burns or fire.
3. Eliminates foreign filler materials from container.
4. Easy to handle, through good grip on side hand braces.
5. Compact loading, resulting in space saving storage.
6. No skilled labor or special tools required. Any man can handle it quickly and efficiently.
7. Also available in 5 gallon and other capacities.

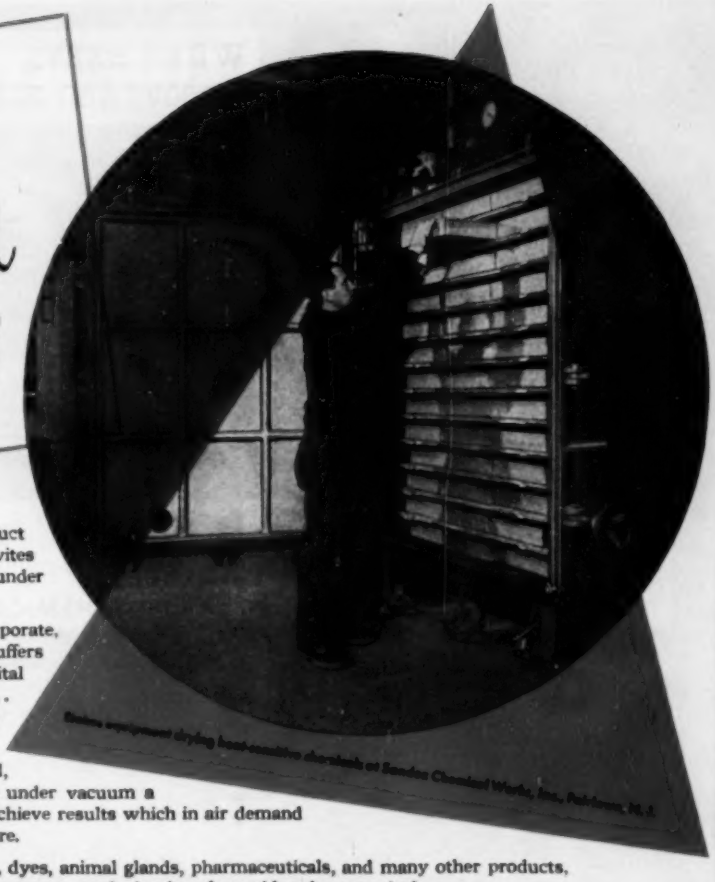
Complies with classification I.C.C. 1-A

For Information write to Dept. E

NATIONAL BOX & LUMBER COMPANY

NEWARK 5, NEW JERSEY

Is it affected by air?



Almost every product which is affected by air invites examination of its behavior under vacuum.

If it will burn, explode, evaporate, deteriorate or oxidize . . . if it suffers chemical change or loss of vital qualities in the presence of air . . . then it should be processed under vacuum.

If heat is necessary, but harmful, vacuum will help because under vacuum a low temperature will achieve results which in air demand a much higher temperature.

For chemical salts, dyes, animal glands, pharmaceuticals, and many other products, low-temperature vacuum drying is safe, rapid and economical.

Stokes Vacuum Shelf Dryers, in many standard sizes, are designed for drying products which must not be agitated or require no mixing. Stokes Freeze-Dryers are used for drying at temperatures below freezing. Stokes Rotary Vacuum Dryers agitate and mix while drying. Stokes Rotating Vacuum Dryers dry and mix simultaneously, by gentle tumbling without agitation.

See Stokes—the only manufacturer of complete vacuum processing systems—on difficult processing problems, or send samples to be tested in the Stokes semi-plant-scale laboratory.

STOKES

F. J. STOKES MACHINE COMPANY, 5500 TABOR ROAD, PHILADELPHIA 20, PA.

BACK IN THE 1880's

WHEN HERTZ DISCOVERED ELECTRIC WAVES

Koven

WAS MAKING INDIVIDUALIZED CHEMICAL EQUIPMENT

The birth of a new era—at last an emergence from the "dark ages" of science and industry. New means of communication — improved techniques for mass production — all this and a world of unlimited horizons was opened by the discovery of electric waves. And during this period of great achievement, KOVEN, today, one of the largest fabricators of steel in the country, was blazing new trails in equipment manufacturing for the chemical industry. Individualized chemical equipment, built to meet the manufacturers' specific requirements, meant greater savings through faster, more efficient production methods. Highly trained KOVEN engineers are ready to help you with your equipment problems. Call or write for a consultation—no obligation.

Our complete modern facilities include: machine, welding, painting and galvanizing shops. X-ray inspection insures quality control. KOVEN equipment in all commercial metals and alloys includes: pressure vessels, extractors, mixers, stills, condensers, kettles, tanks, chutes, containers, stacks, coils. Fabrication to A.S.M.E. Code par U-68 and U-69 a specialty.

L. O. KOVEN & BRO., INC.
154 Ogden Avenue
Jersey City 7, N. J.

Jersey City, N. J.

Dover, N. J.

KOVEN FOR INDIVIDUALIZED CHEMICAL EQUIPMENT SINCE 1881

SMOOTH SURFACE
Assures Free Flow

FLOWLINE
TRADE MARK

STAINLESS STEEL, MONEL, NICKEL and INCONEL WELDING FITTINGS

For Dependable Corrosion Service

Free flow is a fundamental requirement of a piping system for corrosion service. The use of FLOWLINE fittings provides a smooth interior surface — without scratches, ridges, pockets, or sharp corners.

All FLOWLINE fittings — of which the 90° ell shown above is typical — include unique features that have been developed through our long specialization in the design and production of welding fittings for corrosion service.

The Welding Fittings organization was the first to standardize, manufacture, and stock a complete line of stainless welding fittings. Tees, ells, reducers, stub ends, and caps are available in sizes ½" through 12", in various pipe schedules.

Features of *FLOWLINE* Ells

WELDING FITTINGS CORP.
NEW CASTLE, PENNSYLVANIA
World's Largest Manufacturer of Stainless Welding Fittings

WHEN POWELL VALVES GO IN, MAINTENANCE GOES OUT!

With today's urgent need for maximum production, why take a chance on any valves that require constant attention?

By installing Powell Valves—built for perfect performance with minimum maintenance—you can stop worrying about your flow control equipment.

★ *Quality line throughout "The Line"* ★

Gate, Check, Globe and Y Valves, in Bronze, Iron, Steel and Corrosion-Resisting Metals and Alloys

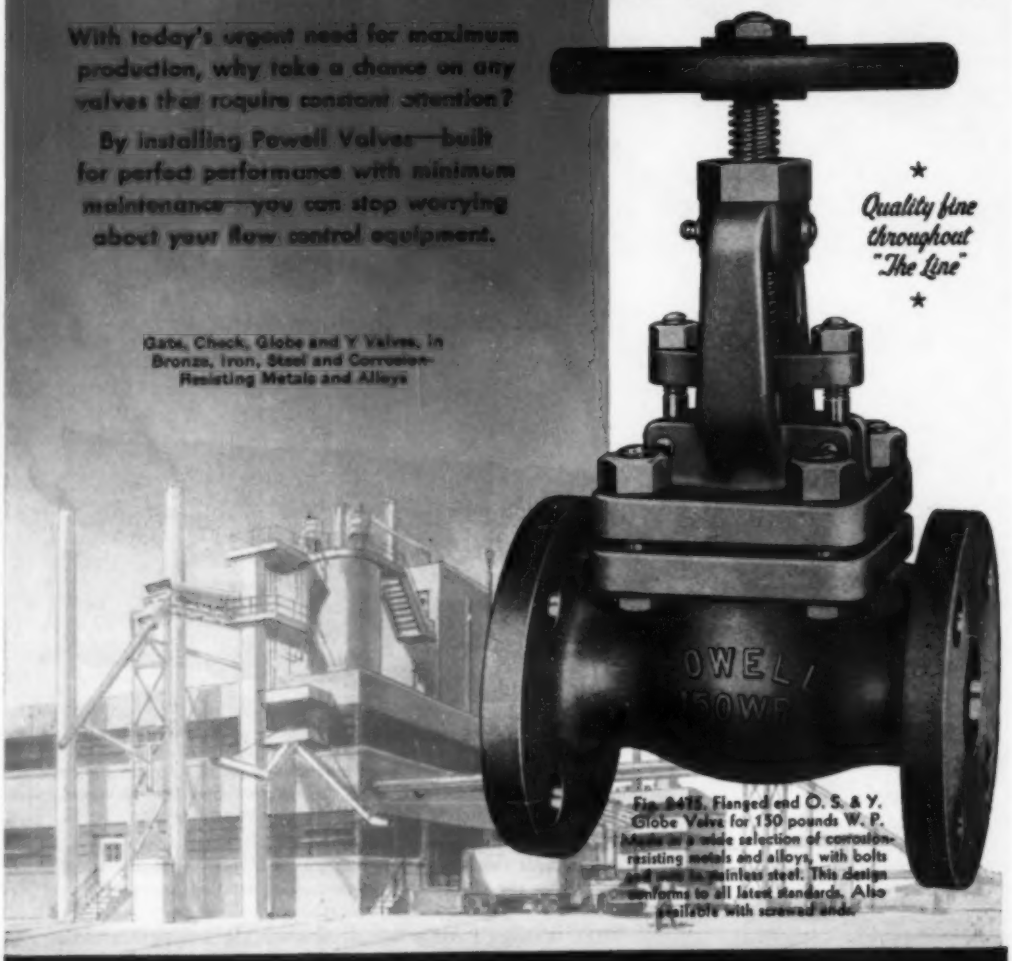


Fig. 8415. Flanged end O. S. & Y. Globe Valve for 150 pounds W. P. Made in a wide selection of corrosion-resisting metals and alloys, with bolts and nuts in stainless steel. This design conforms to all latest standards. Also available with screwed ends.

POWELL

The WM. POWELL CO., 2525 Spring Grove Ave., P. O. Box 106, Station B, Cincinnati 22, Ohio

NOTES for Process Engineers

C. H. Wheeler OF PHILADELPHIA

COOLING TOWERS—VACUUM REFRIGERATION—HIGH VACUUM PROCESS EQUIPMENT—MICRO-PARTICLE REDUCTION MILLS—STEAM CONDENSERS—STEAM JET EJECTORS—MARINE CONDENSERS & EJECTORS—DECK MACHINERY

YOU MAY BE ABLE TO LOWER YOUR COOLING COSTS

INVESTIGATE C. H. WHEELER STEAM JET VACUUM COOLING SYSTEMS

Where your chilled water temperature requirements are 35° to 65°F and you have steam available, C. H. Wheeler engineers are prepared to submit recommendations on equipment for the lowest operating cost consistent with reliability and the necessary marginal factors on performance. In addition to the low first cost of these units, the absence of moving parts (with the exception of pumps) results in extremely low maintenance costs.

In the chemical industry, the chilling of water for finishing rolls in the manufacture of paper and rubber, for sulphite mills and other places employing acid recovery apparatus of the absorption type, are typical applications of C. H. Wheeler steam jet vacuum cooling systems. Cooling is by the well known principle of Flash Evaporation, using live or exhaust steam that you may be presently wasting.

A 36-page book on C. H. Wheeler Steam Jet Ejectors will be mailed you on request. It contains useful data and will augment your store of knowledge on the subject.

$13,500 ESTIMATED SAVINGS

IN 6 YEARS WITH A C. H. WHEELER COOLING TOWER

A C. H. Wheeler customer worked out his own engineering estimate of the savings assured through the purchase of a 3 cell C. H. Wheeler Cooling Tower of 12,500 GPM capacity. He chose C. H. Wheeler over a competitive 2-cell tower costing $10,000 less. The greater efficiency of C. H. Wheeler tower engineering results in estimated yearly operating savings of $2,261.

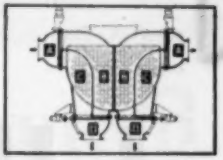
The formula employed by the customer and a tabulation of his figures has been reproduced for your appraisal. This, together with Catalog 145, will augment your knowledge of cooling tower operation. A request on your company letterhead will bring them by return mail.

Be sure to call a C. H. Wheeler representative early in your cooling tower plans. He shows you where to check for features of quality.

"REVERSE FLOW" CONDENSERS

Reduce Operating Costs because they are SELF-CLEANING

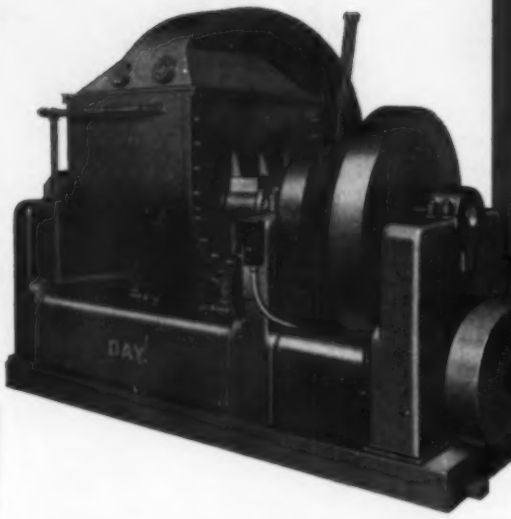
By an arrangement of electrically or hydraulically controlled sluice gates the flow of water through the condenser tubes is reversed. Refuse is flushed down the discharge in minutes, thus saving hours of downtime for hand cleaning. Here is how it works:



Both halves work the same but independently of each other. Right Side: (normal flow) Water enters divided water box at valve chamber A, with power port open. It flows through pass C to end of condenser, back through pass B and out through left port of D.

Left Side: Flow is reversed: Valves at inlet A and discharge D are changed to permit water to flow through B and back through C in the opposite direction, then out through D.

C. H. WHEELER MANUFACTURING CO., 1808 SEDGLEY AVE., PHILADELPHIA 32, PA.



DAY
HEAVY DUTY MIXERS

FOR DAY-IN, DAY-OUT *Dependability*

Perfect control of production is vital to quality output. Day-in and day-out, you can count on DAY Heavy Duty Mixers for consistent performance in processing pastes, semi-pastes and plastic products. They are available with or without vacuum features.

FRAME is heavy cast iron with spread ties closely keyed and bolted to match the strength of one-piece construction.

JACKETED TANK is built to withstand pressure of 100 pounds per square inch. Agitator shaft is special heat treated alloy steel. A dump screw insures positive tilting action.

COVER can be flat, vaulted or vacuum type construction, hinged at rear and perfectly aligned with the tank. Electric interlocking prevents dumping when the cover is in mixing position. Pneumatic or hydraulic cylinder for operating the vacuum cover.

BEARINGS are double-row, roller type, oversized to withstand emergency overloads. Helical cut gears insure quiet operation. Gear drive for dumping mechanism is fully enclosed and runs in oil.

Let your J. H. Day Sales Engineer show you the advantages of DAY Cincinnatus Mixers. Or write direct to The J. H. Day Co., Inc., 1147 Harrison Ave., Cincinnati 22, Ohio.

THE J. H. DAY COMPANY
CINCINNATI 22, OHIO

SULPHUR

*Interesting Facts Concerning This Basic Raw Material from the Gulf Coast Region

*MOLTEN SULPHUR

The discharge lines from the wells deliver the sulphur into sumps at collecting stations which are located near the area being "steamed."

The sump is dimensioned to suit operating conditions, as well as the number of wells supplying sulphur. Cast iron has been found the most suitable material for lining the sump, and for the steam coils on the bottom and at the sides which keep the sulphur in a liquid state. When the sump is reasonably full, pumps force the liquid sulphur through insulated pipe lines to the vats. The pumps are especially designed for this service, the moving parts being either submerged in liquid sulphur or steam-jacketed.

Loading operations at our Newgulf, Texas' mine

TEXAS GULF SULPHUR CO. INC.

75 East 45th St. New York 17, N. Y.

Mines: Newgulf and Moss Bluff, Texas

HOOKER CHEMICALS

work for tanners, too!

Producing plump, smooth-grained leathers from rough, tough hides calls for uncanny skill . . . a happy mating of age-old arts with modern science. Hooker is proud to be a regular, trusted supplier of important chemicals used by the Leather Industry.

All told, 30 different industries use these and other Hooker Chemicals. Modern industry relies on Hooker for exceptional purity and uniformity; carefully scheduled shipments; willing technical help.

Make Hooker *your* source for industrial chemicals. Just write on your business letterhead, asking for General Products List 100, plus Technical Data Sheets on products in which you are most interested.

DELIVERIES—Most of the Hooker Chemicals listed here are readily available now. Others will be available in the near future. Your Hooker sales representative will be glad to keep you posted on the current delivery situation.

TANNERS use these Hooker chemicals to: soak hides prior to unhairing; remove hair quickly and safely; adjust pH of processing solutions; preserve hides and skins from attack by moths, fungus and other organisms.

- Sodium Sulfide
- Sodium Sulfhydrate
- Sodium Tetrasulfide
- Caustic Soda
- Muriatic Acid
- Sodium Benzoate
- Paradichlorobenzene

YOU, TOO may be looking for:

high-purity sulfides that dissolve fast, for immediate use

high-strength sulfide solutions that cut your storage requirements

consistent uniformity that helps you standardize on processing methods

• ***For helpful information on these and other Hooker advantages, write us today.***

HOOKER CHEMICALS

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

1-1434

5 FORTY-SEVENTH ST., NIAGARA FALLS, N. Y.
NEW YORK, N. Y. • WILMINGTON, CALIF. • TACOMA, WASH.

SULFUR CHLORIDES • CHLORINATED PARAFFIN • BENZOIC ACID • MONOCHLOROTOLUENE • CYCLOHEXANOL • SODIUM BENZOATE

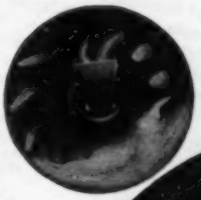
STURTEVANT

Dustless BLENDERS

Produce Perfectly Mixed Products with NO Loss of Materials

RECEIVING

The ingredients to be mixed enter the mixing chamber of the drum through a chute. Note scoops which carry up and dump the ingredients as the drum rotates.



DISCHARGING

By simply throwing a lever, the inlet is closed and the mixer is in discharging position. The completely mixed materials drop off the lifting scoops and discharge through chute without segregation of ingredients.

Four-way mixing action produces homogeneous blends. No matter what the densities, weights, finenesses or other physical properties of the ingredients, Sturtevant Dustless Blenders provide *a thoroughly blended product* with no substances floating to remain unmixed. Sturtevant advantages include—single opening for both receiving and discharging . . . "open door" accessibility for quick, thorough cleaning . . . rugged construction for long life and minimum maintenance. Sturtevant Dustless Blenders are available in mixing capacities from 500 to 20,000 pounds. Write for information or engineering assistance.

STURTEVANT MILL COMPANY
100 CLAYTON STREET, BOSTON 22, MASS.

Designers and Manufacturers of

CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

.0017-INCH UNSUPPORTED VINYL FILM
Produced On Farrel Z-Type Calender

Now, for the first time, 1.7 gauge, calendered, unsupported vinyl film is being produced on a commercial scale. The manufacturer, Ross & Roberts, Inc., of Stratford, Connecticut, credits the development of this exceptionally lightweight film to new techniques in calendering and to Farrel-Birmingham's Z-type calender.

The Z-type four-roll calender was designed by Farrel-Birmingham for just such precise production as this—production that demands extreme accuracy of gauge and temperature control. The verigraph charts show how consistently the required gauge can be maintained by this machine in running vinyl film.

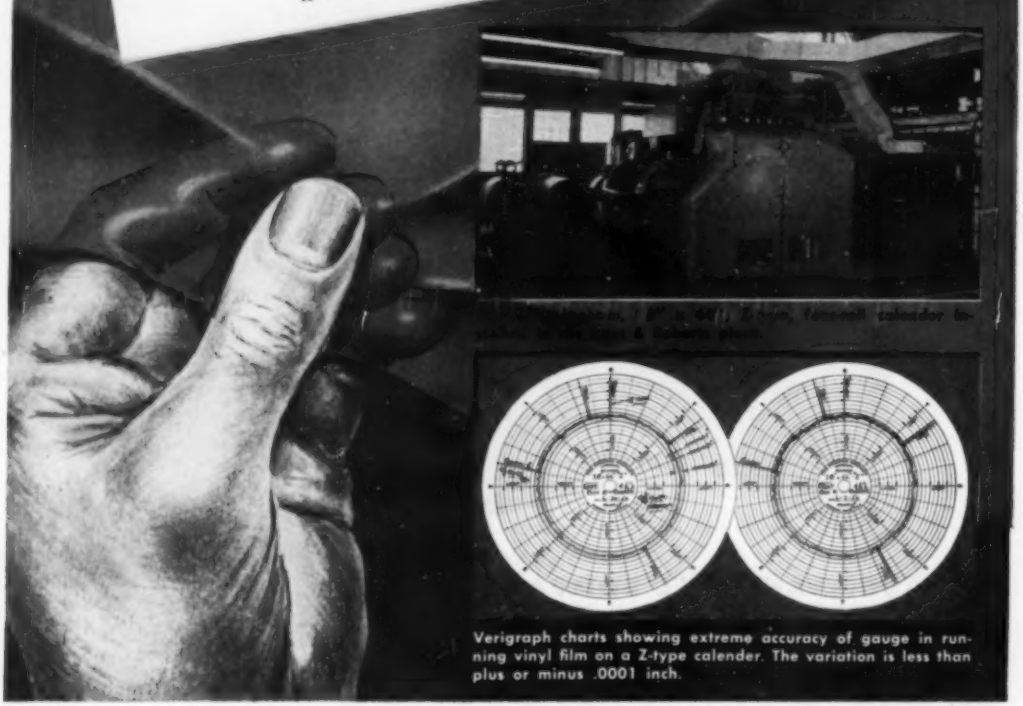
In addition to unsupported plastic film, Z-type calenders are ideally suited for producing sheet and for single and double coating. They are available in a wide range of sizes, from small experimental machines to large production sizes.

Farrel-Birmingham engineers will be glad to discuss your calendering requirements with you at any time. Or, for general information about Farrel-Birmingham rubber and plastics calenders, send for a copy of new 32-page bulletin, No. 174.

FARREL-BIRMINGHAM CO., INC., ANSONIA, CONN.
Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

Farrel-Birmingham®

FB-684



Verigraph charts showing extreme accuracy of gauge in running vinyl film on a Z-type calender. The variation is less than plus or minus .0001 inch.

HORTON STRUCTURES

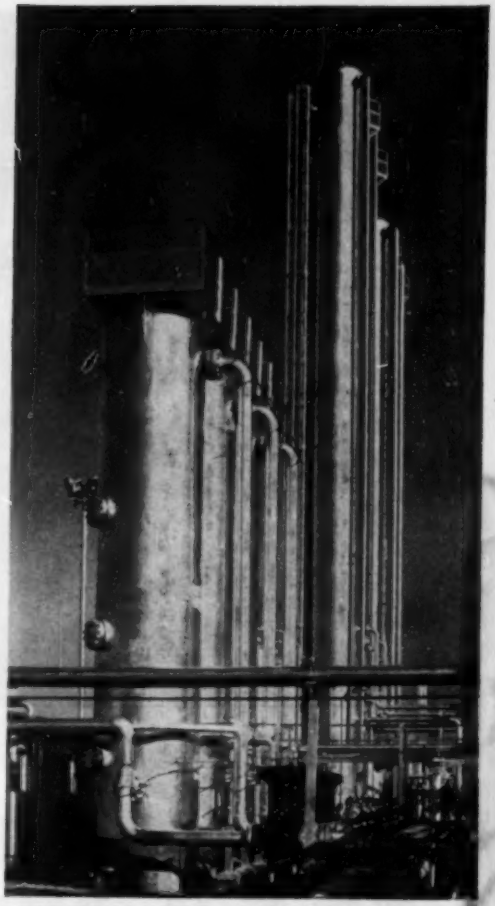
MADE TO ORDER FOR NEW GASOLINE PLANT

The Gulf Oil Corporation increased the compressor capacity at its Eunice, N. M., gasoline plant early this year, stepping up the amount of gas processed from 43 to 58 million cu. ft. per day. Recovery of liquid products is now approximately 950 barrels of 20 lb. Reid vapor pressure gasoline, 750 barrels of butane, and 1600 barrels of propane per day.

Playing an important part in the operation of the Eunice gasoline plant are a group of Horton* structures which were built to the specifications drawn up by the Hudson Engineering Corporation. Among the processing units we furnished are a propanizer, a depropanizer, three dehydrators, and two absorber columns. Horton storage facilities consist of eight propane tanks, six butane tanks, and six natural gasoline tanks—all cylindrical in shape with hemispherical ends.

Throughout the petroleum, petrochemical and chemical industries, Horton structures are playing a vital part in increasing production and attaining new operating efficiencies. For information on steel or corrosion resistant metal storage tanks and processing equipment, write our nearest office. There is no obligation on your part.

* *Registered U. S. Patent Office.*



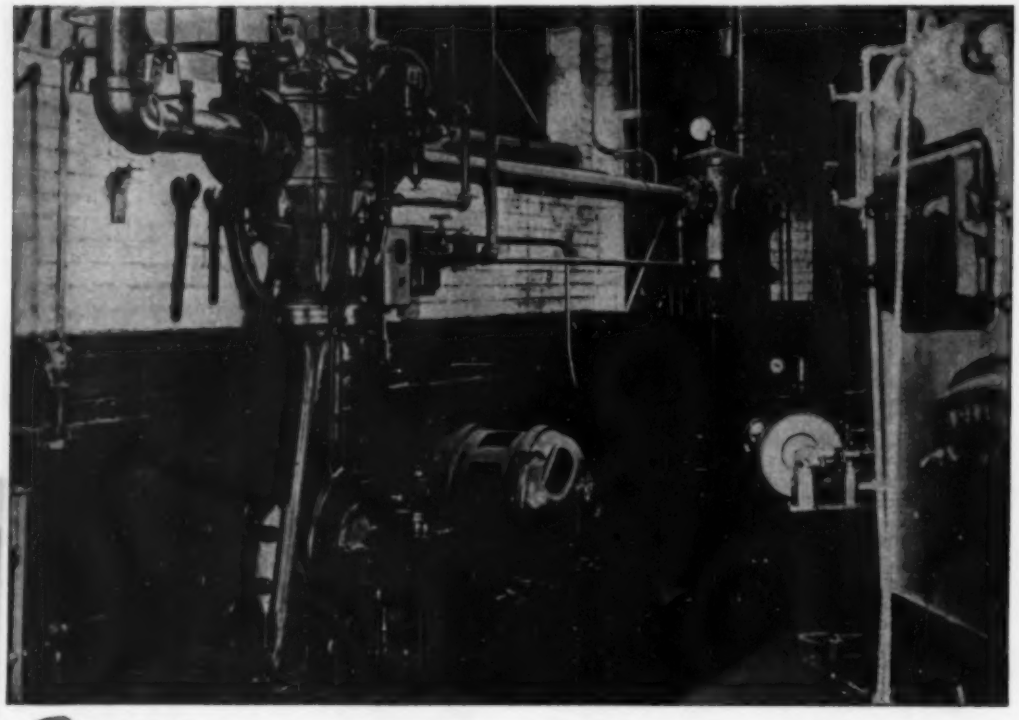
Close-up view of three 4½-ft. diam. by 24-ft. gas dehydrators built by Chicago Bridge & Iron Company for the Gulf Oil Corporation's Eunice, N. M., gasoline plant.

Twenty 1,000-bbl. cylindrical tanks with hemispherical ends used to store propane, butane and natural gasoline at the Eunice gasoline plant.

CHICAGO BRIDGE & IRON COMPANY

Atlanta 3.....2120 Healey Bldg.
Birmingham 1.....1510 North Fiftieth St.
Boston 10.....1005—201 Devonshire St.
Chicago 4.....2124 McCormick Bldg.
Cleveland 15.....2220 Guildhall Bldg.
Detroit 26.....1503 Lafayette Bldg.
Houston 2.....2103 National Standard Bldg.
Los Angeles 17..1505 General Petroleum Bldg.
New York 6.....3318—165 Broadway Bldg.
Philadelphia 3...1625—1700 Walnut St. Bldg.
Salt Lake City 4....305 West 17th South St.
San Francisco 4.....1522—200 Bush St.
Seattle 1.....1305 Henry Bldg.
Tulsa 3.....1623 Hunt Bldg.
Washington 6, D. C.....1160 Cafritz Bldg.

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

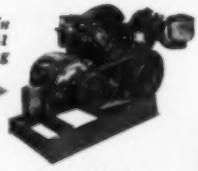


SAVE VALUABLE SPACE WITH THE EFFICIENT

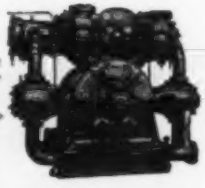
JOY WG-9 HEAVY DUTY AIR COMPRESSOR

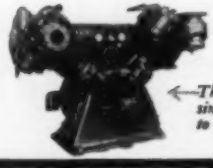
The JOY WG-9 Vertical, with its small base, saves valuable floor space. Built in a range of sizes to 881 CFM, for continuous heavy-duty service. The complete line of JOY stationary units—high and low pressure compressors, oil-free compressors, boosters and vacuum pumps—includes a type for every need, each incorporating exclusive features developed by JOY research. Supplementary products include the only complete line of vaneaxial fans and blowers, and the new JOY Oxygen Generator. ● *Write for free Bulletins.*

The JOY WL-80, in eleven sizes up to 641 CFM, with operating pressures to 125 psi. →



The JOY WN-114, in single or twin units up to 7312 CFM. →





←*The JOY WN-112, in single or twin units up to 3656 CFM.*

Consult a Joy Engineer

WAD 19798

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING • PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

Now CMH *offers*

a proved expansion joint for pressures up to 5500 psi

Advancements in the design of the CMH FLEXONIFLEX Expansion Joint—the "proved-in-service" high pressure expansion joint—now make it possible to offer units for working pressures up to 5500 psi. For all power and process applications it means that the advantages of compact, easy-to-install expansion control may be used at pressures far beyond those which had previously been considered safe.

Standard FLEXONIFLEX units have bellows type stainless steel pressure carriers, single or multiple ply, lined or unlined with integral control rings and end sections. Sizes range from 5/8" through 6" I.D., although larger sizes can be furnished. Suitable for temperatures from sub-zero to 1600° F. (higher with special materials).

For specific recommendations send complete details of your application.

OTHER CMH EXPANSION JOINTS

For low and medium pressure service you may take advantage of the same engineering skill that has developed FLEXONIFLEX units. CMH Controlled-Flexing Expansion Joints are available in copper or stainless steel for pressures up to 300 psi, sizes to 48" I.D. CMH Free-Flexing Expansion Joints are also available in copper or stainless steel for pressures up to 30 psi. sizes to 48" I.D. Larger sizes are available in both types for special applications.

Flexon identifies CMH products that have served industry for over 49 years.

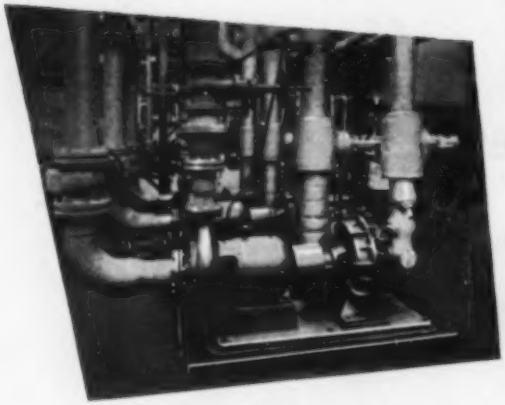
CHICAGO METAL HOSE Corporation

1317 S. Third Ave. • Maywood, Ill. • Plants at Maywood, Elgin, Rock Falls, and Savanna, Ill.
In Canada: Canadian Metal Hose Co., Ltd., Brampton, Ont.

CMH

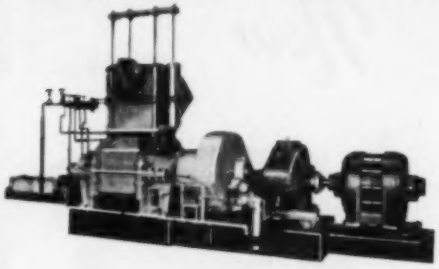
ONE DEPENDABLE SOURCE
for every flexible metal hose requirement

Convoluted and Corrugated Flexible Metal Hose in a Variety of Metals • Expansion Joints for Piping Systems
Stainless Steel and Brass Bellows • Flexible Metal Conduit and Armor • Assemblies of These Components



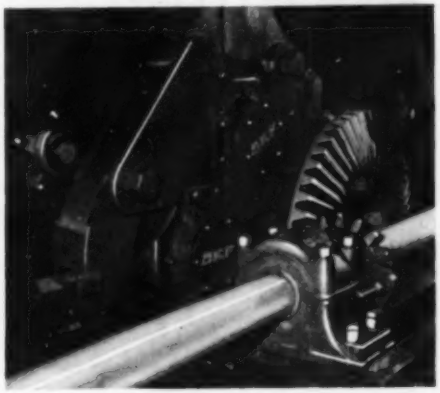
SKF-equipped Ingersoll-Rand Company HC Pumps.

SKF-equipped Stewart Bolling & Company, Inc., Intensive Mixer.



SKF-equipped Bird Machine Company Continuous Centrifugal Filter.

SKF-equipped Derrick & Hoist Company Sugar Mill.



why do so many prefer SKF?

It's pretty hard *not* to buy good bearings today, but SKF is the preferred bearing with many chemical equipment manufacturers.

There are good reasons why!

These manufacturers know SKF as a reliable, friendly supplier. They've learned to have implicit confidence in the experienced bearing engineering specialists at SKF's headquarters. They appreciate the teamwork of SKF field men who are qualified specialists in the application of bearings to chemical equipment.

Their customers know the value of the complete maintenance service available to them through SKF's Distributor Organization.

Whatever your product, your engineers and designers can have this helpful SKF teamwork simply by asking for it. 7284

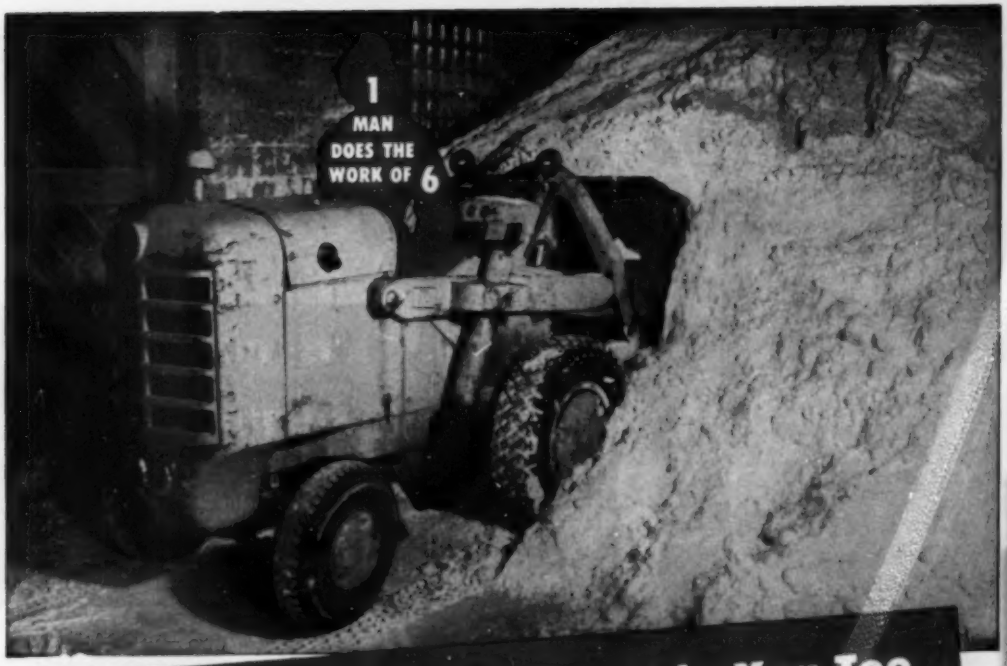
SKF

BALL AND ROLLER BEARINGS

8 REASONS WHY SKF IS PREFERRED BY ALL INDUSTRY

integrity • craftsmanship • metallurgy
tolerance control • surface finish
product uniformity • engineering service
field service

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.—*manufacturers of* **SKF** *and* HESS-BRIGHT *bearings.*



PAYLOADERS Can Help You Too

THE chemical and fertilizer industries are constantly adding to their fleets of Hough PAYLOADERS because these unit-built tractor-shovels are a sure, proven way to lick rising costs, solve manpower shortages and increase output.

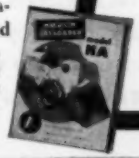
A PAYLOADER more than pays its way every day — actually pays for itself within a few months doing the many jobs listed here and doing them faster and cheaper . . . releasing manpower for more productive work.

The 12 cubic foot Model HA shown is the smallest of the PAYLOADER line that includes graduated sizes up to 1½ cubic yard bucket capacity. Every PAYLOADER is a complete, Hough-built tractor-shovel specifically designed with multiple reverse speeds and other features that insure fast, low-cost bulk material handling. They are backed by 30 years of material-handling equipment manufacture and are sold and serviced by a world-wide Distributor organization. The Frank G. Hough Co., 754 Sunnyside Ave., Libertyville, Ill.

On These Jobs

- Unload box cars
- Dig and carry fertilizers, chemicals, all loose materials
- Feed conveyors, hoppers, baggers, elevators
- Unload trucks
- Load box cars
- Carry bagged materials
- Clean up aisles, gangways
- Maintain private roadways
- Handle coal, coke, ashes
- Stockpile coal and materials
- Remove snow
- Lift-pull-push

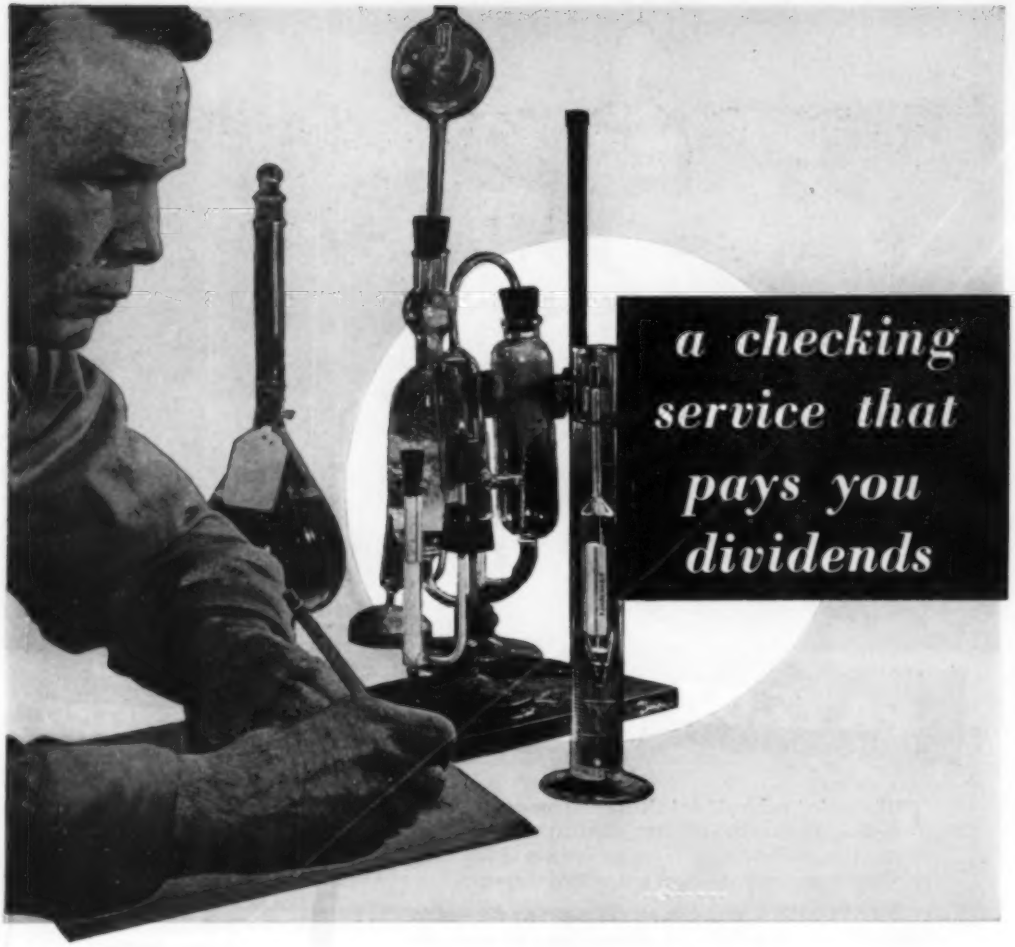
Literature on any size PAYLOADER will gladly be sent without obligation.



SAY "HUFF"

PAYLOADER®

THE FRANK G. HOUGH CO. • Since 1920



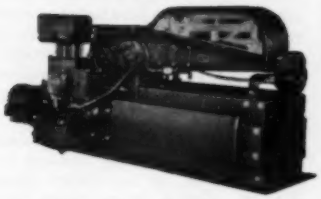
Continuous laboratory control during the manufacture of Roosevelt's aliphatic naphtha solvents pays you dividends in ***better products*** . . . in ***satisfied customers.*** Why? Because this important part of the complete Roosevelt refining process guarantees that the naphthas you buy will always meet your specifications. Roosevelt gives you another important dividend, too! It is ***complete*** catalytic, sulphur removal. That means chemically stable solvents, free of offensive odors. Submit your solvent specifications to Roosevelt, today!

Write for your copy of Roosevelt's book of specifications.

ROOSEVELT
oil and refining corp.
MT. PLEASANT, MICHIGAN

W&T MERCHEN WEIGH FEEDERS

Give Greater Product Uniformity



Weigh-blending of chemical ingredients — the only *accurate* way to blend—calls for precision equipment and "know-how".

W&T Merchen Weigh Feeders meet the first of these requirements with these features:

- Feed and weigh in *one* operation
- Handle ounces to hundreds of pounds per minute
- Manual or automatic control
- Easy accessibility
- Handy feed register
- Meet underwriters class II group G specifications

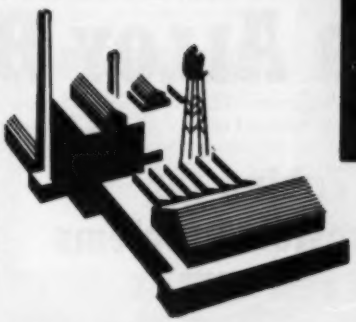
Your W&T Representative brings you the "know-how" from his experience in supervising and servicing hundreds of Merchen Weigh Feeder installations.

Write today for Descriptive Bulletins.

M-15a

WALLACE & TIERNAN COMPANY, INC.

INDUSTRY selects FURFURYL ALCOHOL



Why?

Furfuryl alcohol (FA*) is a primary alcohol, but its behavior pattern is greatly modified by the furan ring. This combination results in some unusual properties which make it attractive to a number of industries.

1. SOLVENT:

FA is a powerful resin solvent and has the added ability in a number of cases to react with the resin itself thus becoming a part of the final product. For example, in the manufacturing of grinding wheels, FA is a solvent for the phenolic resin binder, and reacts with it in the curing cycle, resulting in a tough bond with minimum production of volatiles.

2. CHEMICALLY INERT RESIN:

FA is extremely reactive in the presence of acids with or without the application of external heat. When such resin is cured, acid, solvent, and alkali inert products are formed. These resins form the basis for corrosion resistant mortars, cements, reinforced linings, and molded chemical-inert equipment.

3. RING OPENING REACTIONS:

Although not yet as commercially important as the solvent and resin applications, reactions involving the FA ring offer potentially valuable routes to chain compounds such as levulinic acid.

Now is the time to write for a bulletin about FA and to become better acquainted with the properties of this industrial chemical.

*Reg. U. S. Pat. Off.

The Quaker Oats Company — CHEMICALS DEPT.

3358 THE MERCHANDISE MART
CHICAGO 54, ILLINOIS
New York, Room 3358, 120 Wall St., N. Y. 5, N. Y.

In San Francisco, The Griffin Chemical Company • In Australia, Swift & Company, Pty. Ltd., Sydney • In Europe, Quaker Oats-Graanproducten N. V., Rotterdam, The Netherlands; Quaker Oats (France) S. A. 42, Rue Pasquier, Paris 8E, France • In Japan, F. Kanematsu & Company, Ltd., Tokyo

BRIDGEPORT BRASS COMPANY
CONDENSER AND HEAT EXCHANGER TUBE EDITION

COPPER ALLOY BULLETIN

"Bridgeport" MILLS IN BRIDGEPORT, CONN. AND INDIANAPOLIS, IND.—IN CANADA: NORANDA COPPER AND BRASS LIMITED, MONTREAL

Duplex Tubing for Difficult Corrosion Problems

Atmospheric Cooler made from Duplex Tubing with arsenical Admiralty to the sprayed water side and stainless steel to the product side. Courtesy Celanese Corp. of America, Chemcel Plant, Bishop, Tex.

Frequently a relatively minor constituent may cause much more trouble than the medium itself. For example, pure water has practically no effect on stainless steel, yet water with a small amount of chlorides (a few parts per million) may lead to serious failures under certain conditions.

Atmospheric Cooler

An example of such failure occurred in an atmospheric cooler made from stainless steel tubing. Stress corrosion cracking took place on the outside of the tubing where it was subjected to a spray of fresh water containing a small amount of chlorides. The stainless steel stood up satisfactorily on the inside against acetic acid containing some formic acid.

Stress-corrosion cracking had developed from the water side and destroyed the usefulness of the tubing. However, by changing over to Duplex Tubing with arsenical Admiralty to the water side and stainless steel to the product side, the service life of the atmospheric cooler has been greatly increased. In addition, the heat transfer properties have also been substantially improved by the use of Duplex Tubing in its construction.

Stainless vs. Copper Alloys

The above illustrates the importance of studying the corrosion characteristics of each metal and applying the one best suited to withstand the particular corrosive media involved. It is recognized that in general, stainless steels are resistant to a large number of corrosive media. On the other hand, copper and its alloys possess excellent corrosion resistance to many gases, acids and salts and their water solutions. This explains their wide usage for handling cooling waters and other solutions that contain salts and gases.

Many users of stainless steel tubing have learned through experience what can and cannot be accomplished with stainless steel. Its fine performance in certain services has revealed that conservation of critical materials can often be achieved by using considerably thinner gauges.

Where one surface of the stainless steel tubing requires the corrosion resistance of copper and copper alloys towards cooling waters, brine, and certain chemicals, Duplex Tubing offers great possibilities.

Stainless steel is outstandingly superior to copper towards impingement corrosion by steam and other gases but may be subject to attack on the water side. Thin stainless steel tubes lined with copper or a copper alloy offer a solution to this type of corrosion problem. At the same time, the fine heat transfer characteristics of copper are imparted to this Duplex tube combination. This means that heat exchangers and condensers, designed around straight copper tubes, can be retubed with copper lined stainless steel Duplex Tubing without any over-all loss in heat transfer rate.

Along the same lines, low chrome steels and stainless steels have in certain types of vent condensers and gas coolers given good performance except where the alloy is vulnerable to either stress corrosion cracking or pitting in certain types of fresh and sea waters.

Under conditions of low water velocity these ferrous alloys are quite susceptible to fouling by certain types of marine organisms in sea water. Biofouling may contribute toward rapid corrosion pitting and may cause a marked reduction in heat transfer rate. The use of a lining of copper or certain copper alloys assures considerable freedom from biofouling. For additional information on applications of Duplex Tubing, write for Bridgeport "Duplex Tubing Technical Bulletin No. 1950". (7216)

for

SIFTING AERATING ELEVATING

DRY POWDERS

DAY MOTO-SIFTER ELEVATOR

Get thorough aeration of dry powdered materials, plus rapid and efficient removal of undesirable particles, with the DAY Moto-Sifter and Elevator.

It's handy, portable, self-contained. Easily moved to your job location, it aerates, sifts and elevates your product direct to bin or mixer.

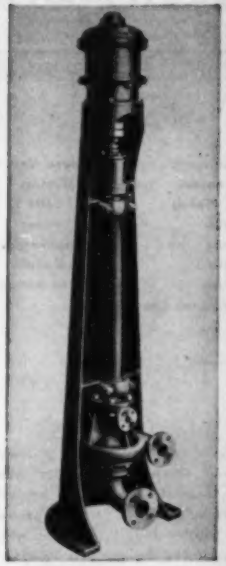
Write for details.
The J. H. Day Co., Inc.,
1147 Harrison Ave.,
Cincinnati 22, O.

DAY

THE J. H. DAY COMPANY
INCORPORATED
CINCINNATI 22, OHIO

(Right) Structural details of Lawrence Vertical Acid Pump.

(Below) Vertical Acid Pump for outside mounting.



VERTICAL ACID AND CHEMICAL PUMPS

The vertical acid pump illustrated here shows how Lawrence engineers met a particularly difficult pumping problem. Chemical action made it imperative to eliminate packing. While packing is used below the top bearing to confine fumes, it does not come in contact with the acid because the liquid level of the supply tank is kept below that point. This construction is typical of Lawrence advanced engineering design.

Other design features of Lawrence pumps for acids and chemicals include the use of metals and alloys carefully chosen to give the best possible protection against the corrosive and abrasive action of the liquid pumped, as well as structural strength and long wear.

If you have to pump any acid or chemical, hot or cold, write us the pertinent details. No obligation.

Send for bulletin 203-4 for a complete summary of acid and chemical pump data.

LAWRENCE PUMPS

LAWRENCE
MACHINE & PUMP CORPORATION
369 MARKET STREET LAWRENCE, MASS.

IT'S WHITLOCK FOR PROCESS EQUIPMENT

WHAT WE MAKE

Heat Exchangers
Desuperheaters
Fabricated Piping
Coolers
Columns
Condensers
Receivers
Vacuum Chambers
Pressure Vessels
Heaters
Coils
Towers
Evaporators
Reboilers
Fabricated Assemblies

MATERIALS WE USE

Carbon Steel
Chrome Steels
Nickel Steels
Nickel, Monel, Inconel
Stainless Steels
Copper and Copper Base Alloys
Aluminum
Clad Materials
Hastelloy
Karbate
Wrought Iron

OUR PRODUCTION PROCESSES

Rolling
Forming
Machining
Pipe Bending
Coiling
Metallic Arc Welding
Oxyacetylene Welding
Inert Gas-Shielded Arc Welding
Atomic Hydrogen Welding
Heat Treating and Stress Relieving
Hydrostatic and Air Testing
Radiography
Tensile Testing

Petroleum and process industries make Whitlock their source for process equipment of all kinds: standard or special designs—in ferrous or non-ferrous materials—for high or low pressures—for high or low temperatures. Whitlock Engineers, Whitlock facilities, and Whitlock manufacturing techniques are ready to serve you. For recommendations, write The Whitlock Manufacturing Co., 94 South Street, Hartford 10, Conn.

WHITLOCK

DESIGNERS AND BUILDERS OF Boilers • Coils • Condensers • Coolers • Heat Exchangers • Heaters • Piping • Pressure Vessels • Separators • Towers

...Closer Product Control
...Lower Operating Costs
...Increased Capacity

Planned... ENGINEERED

● If new product developments have affected your operating efficiency or limited your plant capacity—call on a Ferguson First Team of qualified engineers to assist you in an expansion or modernization program. These men are selected for their training and experience in every phase of the chemical industry.

Consider complete instrumentation and mechanization for resulting lower operating costs, closer product control and increased efficiency in both processing and material handling.

Preliminary Discussions in Confidence and Without Obligation

THE H. K. FERGUSON COMPANY
ENGINEERS AND BUILDERS

Headquarters:
Ferguson Building, Cleveland, Ohio

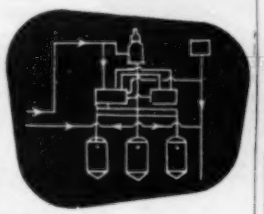
District Offices:
New York, Houston, Chicago, Los Angeles, Cincinnati

EXPERIENCE... THE FOURTH DIMENSION

How to select a PROTECTIVE COATING

CHECK RESISTANCE TO CORROSIVE MEDIA

How well a coating withstands the action of a given corrosive agent is the first factor you must necessarily consider in choosing the right coating for your needs — but it's *only* the first.



CHECK ADAPTABILITY TO SERVICE CONDITIONS

The second factor — and one you can't always predetermine by laboratory test — is on-the-job performance. That's governed, in turn, by the kind of metal you're protecting . . . the condition of the surfaces . . . how the equipment is constructed . . . conditions encountered during its operating cycle . . . during idle periods — considerations that must be surveyed in detail before you can select a protective coating with reasonable assurance it will successfully meet your requirements.

Dampney equipment-engineered coatings give you that assurance because they are formulated to do certain selective, specialized jobs both large and small, difficult and routine — to give you the protection that is right for you — not in a costly, custom-made material nor an all-purpose anti-corrosive, but in a coating *engineered for the equipment it is to protect.*

Dampney's industrial equipment knowledge is yours to call upon freely. Let us put it to work on your next coating problem.

MAINTENANCE FOR METAL

THE DAMPNEY COMPANY

140-1 BOSTON 36, MASSACHUSETTS

MATHEMATICS FOR ENGINEERS

Just Out—3rd Edition

1 Covers every phase of mathematics the engineer is likely to meet—from algebraic notation, determinants, and linear equations—through differential calculus, curve analysis, integration, summation, etc. Revised 3rd edition contains much added material including chapters on Differential Equations, and Dimensional Analysis, with emphasis on the Buckingham pi theorem. **By Raymond Dull, and Richard Dull, Webster - Chicago Corp. 822 pages, 671 illus., $7.50**

INDUSTRIAL PIPING

Just Out!

2 Brings together a vast store of essential information—supplying the piping designer and erection foreman valuable information on what materials and what kind of pipe and fittings should be used, and where. Data on each service—water, gas, steam, etc.—includes methods of flow calculations; most commonly used materials, fittings, and valves. Gives data on estimating piping costs. **By Charles T. Littleton, Formerly Engineer in Charge of Piping, American Cyanamid Company. 304 pp., 179 illus., 230 tables. $6.00**

FUNDAMENTALS OF ATOMIC PHYSICS

Just Out!

3 Designed to be as simple as possible, this book gives engineers a groundwork in atomic and nuclear fundamentals. Covers high-voltage particle accelerators, the kinetic theory of gases, charge and mass of electron, electronics, photoelectric effects, X-rays, the Bohr theory of the origin of spectral lines, electron configuration in atoms. Treats matter waves, isotopes, and other important factors. **By Saul Dushman, Research Consultant, Gen. Elec. Co. 294 pages, illus., $5.50**

NONMETALLIC MINERALS

4 Revised Second Edition provides a complete coverage of nonmetallic minerals—essential as raw materials to the chemical, construction, ceramic, fertilizer, and abrasive industries, as well as other important fields. Explains where nonmetallic minerals are found, how they must be treated for commercial acceptance and use, the size and distribution of markets, and price ranges. **By Raymond B. Ladoo, Consulting Engineer, and W. M. Myers. 688 pages, 18 illus., $10.00**

SEE THESE BOOKS 10 DAYS FREE

McGraw-Hill Book Co., Inc.
330 West 42nd St., NYC 18

Send me book(s) checked below for 10 days' examination on approval. In 10 days I will remit for book(s) I keep, plus few cents for delivery, and return unwanted book(s) postpaid. (We pay delivery if you remit with this coupon—same return privilege.)

- ☐ 1. Dull & Dull—**MATH FOR ENG—$7.50**
- ☐ 2. Littleton—**INDUSTRIAL PIPING—$6.00**
- ☐ 3. Dushman—**ATOMIC PHYSICS—$5.50**
- ☐ 4. Ladoo & Myers—**NONMETALLIC—$10.00**

(print)
Name .....
Address .....
City ..... Zone .... State .....
Company .....
Position CE-10-51
This offer applies to U.S. only.

Control Costs with TOLEDO

On your scale material becomes money!

50th ANNIVERSARY 1901-1951

PRINTWEIGH STOPS ERRORS . . . Provides printed weight records—at the instant of weighing—assuring that the accurate indication of the Toledo dial will reach your accounting records without chance of human error.

Modern Toledos meet your needs today for *rapid, accurate* scales in all phases of production . . . to help you *control costs!*

These are the scales backed by Toledo's half-century of experience in Research and Engineering that has produced 80% of the major advances in scales during this time.

Toledo engineering has not only specialized in the direct design of weighing machine mechanisms, but also in the many associated fields such as electronics, plastics, metallurgy, optics.

Check your needs *now*—select Toledo equipment for vital jobs in guarding materials and costs! Sales and service in 200 cities. Toledo Scale Company, Toledo 1, Ohio. We will be very glad to send catalogs.

NEW!
FLOOR SCALES
New recessed frame design fully guards against foreign material lodging beneath platform edge—choice of full or semi frame, with economical conversion for future needs. Double parallel link platform suspension means long life, accurate dependability. Send for bulletin 2406C.

TOLEDO

HEADQUARTERS FOR SCALES

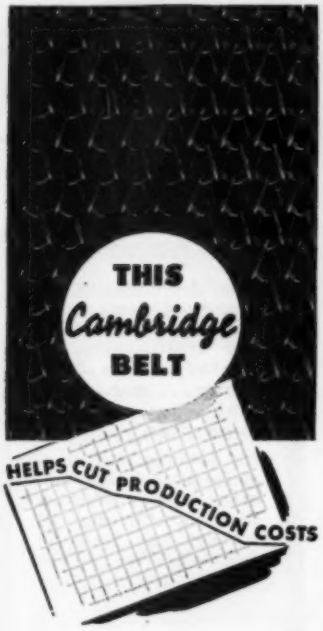
Today's Swing is to

DARNELL
CASTERS & WHEELS

• Save Money, Floors, Equipment and Time by using DARNELL Casters and Wheels.

FREE Manual

DARNELL CORP LTD
LONG BEACH 4 CALIFORNIA
60 WALKER ST NEW YORK 13 N Y
36 N CLINTON CHICAGO 6 ILL



. . . in drying, baking, filtering or other chemical processes. *Balanced Weave* is low in initial cost, combines high tensile strength, and strain resistance with straight belt travel. Mesh opening can be controlled for free drainage or for retention of powdered materials.

Regardless of your specific process, there is a Cambridge woven wire conveyor belt to combine movement with processing of parts or materials.

Woven from any metal or alloy to the mesh or weave that best suits your operating conditions . . . heat, cold or corrosive agents . . . Cambridge belts are constructed to rigid specifications based on our experience in your industry. And any Cambridge belt can be equipped with special drive connections, retaining selvages, cleats, or other attachments for your particular process.

FREE CATALOG. Basic reference manual on conveyor design, belt construction and metallurgy. Write today or call your nearest Cambridge office. See "Belting—Mechanical" in your Classified Telephone Directory.

The Cambridge Wire Cloth Co.
Dept. G • Cambridge 10, Md.

WIRE CLOTH | METAL CONVEYOR BELTS | SPECIAL METAL FABRICATIONS

OFFICES IN PRINCIPAL INDUSTRIAL CITIES

Now... PYREX BRAND

Glass Fractionating Columns

For efficient corrosion-free, visible operation

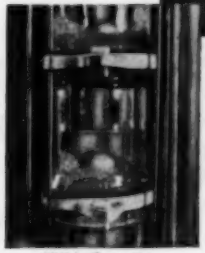
Here is a practical solution to a wide variety of fractionating and absorption problems—for laboratory, pilot plant and commercial operations—where positive protection against corrosion and product contamination is required.

Made of PYREX brand glass, these fractionating columns permit visual observation of flow and performance. Gas and liquid samples may be taken at any time without disturbing operation in any way.

With a throughput of 20 to 25 gallons per hour, PYREX fractionating columns are available in 4" and 6" sizes with any number of bubble and sampling plates.

Sampling Operating Column

Sampler Plate and Downcomer Bottom Section



Visible Operations

COMPARATIVE EFFICIENCY OF 6" PLATE COLUMN

SYSTEM	OVERALL PLATE EFFICIENCY	
	Vapor Velocity (ft/sec)	% Efficiency
Benzene; Carbon-Tetrachloride	0.3	52
	0.5	65
	0.6	63
Methyl-cyclohexane; Toluene	0.3	85
	0.5	82
	0.6	80

PRESSURE DROP/PLATE	
Vapor Velocity (ft/sec)	in. of liquid at boiling pt., for static seal* of ¾ in.
0.1	.8
0.3	1.1
0.5	1.3

*Static seal is distance from top of slot to top of downcomer.

These units provide maximum chemical stability and high resistance to both physical and thermal shock. Corning supplies complete glass column and metal accessories except 2" iron pipe support.

Standard packed columns are available in 4", 6", 12" and 18" dia. sizes, which may be packed with PYREX brand glass Rachig Rings.

Over-all cost is relatively low compared with other corrosion resistant materials. Mail coupon below.

CORNING GLASS WORKS **CORNING, N. Y.**

Corning means research in Glass

Technical Products Division: Laboratory Glassware, Glass Pipe, Plant Equipment, Lightingware, Signalware, Gauge Glasses, Optical Glass, Glass Components

CORNING GLASS WORKS
Dept. CE-10, Corning, N. Y.

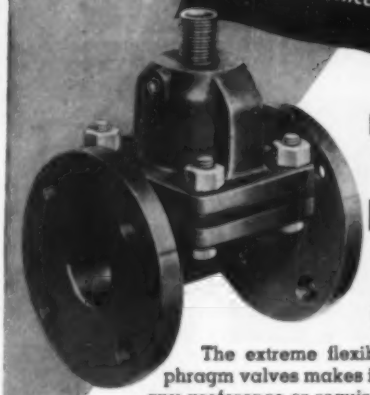
Please send me Data Sheet on PYREX Fractionating and Packed Columns.

NAME_____
COMPANY_____
ADDRESS_____
CITY_____
ZONE____ STATE_____

1851 • 100 YEARS OF MAKING GLASS BETTER AND MORE USEFUL • 1951

Any of these "Proven Operators"

- ✓ Westinghouse, Bendix Westinghouse
- ✓ Barber-Colman, Cutler-Hammer and Philadelphia Limitorque motors
- ✓ All pneumatic motors
- ✓ Air loaded pneumatic motors
- ✓ All double and single action air cylinders
- ✓ Mechanical springs



may be used with HILLS-McCANNA Diaphragm Valves for automatic or remote operation

The extreme flexibility of Hills-McCanna diaphragm valves makes it possible to satisfy virtually any preference or requirement in the use of mechanical operators. All of the operators listed above plus others are applied to standard Hills-McCanna sliding stem valves to provide complete units that utilize your existing operating methods.

Designed especially for conveying "hard-to-handle" fluids such as acids, alkalis, volatile and viscous substances, slurries, semi-solids, etc. Hills-McCanna diaphragm valves give you the advantages of "special" design on a standardized basis. Sizes range from ⅜" through 14" (not all methods of operation are available in all sizes); pressure up to 150 psi; temperatures to 180°F. (some applications to 220°F.). Write for complete information, HILLS-McCANNA CO., 2341 W. Nelson Ave., Chicago 18, Ill.

HILLS-McCANNA

Saunders patent diaphragm valves

Proportioning Pumps

Force-Feed Lubricators • Magnesium Alloy Castings

OMEGA

THE LAST WORD IN FEEDERS . . .

— for dry materials . . . sea coal, trap rock, Vinylite, hydrated lime, zinc hydrosulphite, activated carbon — and liquids . . . acids, chemical solutions, and suspensions.

For Bulletins and complete information, address Omega Machine Company (Division of Builders Iron Foundry) 369 Harris Ave., Providence 1, R. I.

OMEGA MACHINE COMPANY

Smooth Vibrationless PROPELLERS

for MIXING, STIRRING AERATING, PUMPING AGITATION

A Michigan 34" Stainless Steel propeller with split hub for mounting in receptacle through manhole.

Manufactured by an exclusive process, Michigan propellers are perfectly balanced to avoid whip and strain on shafts. They are available for original equipment, replacement or special application in a wide range of materials and in sizes up to 60". Write for latest data folder.

MICHIGAN WHEEL CO.
GRAND RAPIDS 3, MICH.

Check These Advantages of DRACCO Pneumatic Conveyors *for low-cost handling* of YOUR Bulk Materials

When selecting equipment to handle your bulk granular or powdered materials, your logical choice is a "Performance Proved" Pneumatic Conveyor, engineered by Dracco.

LESS LABOR
The automatic, continuous action of a Dracco Pneumatic Conveyor permits sizeable reductions in manpower requirements. In unloading a hopper bottom car for example, one man need be present only 25% of unloading time.

NO DUST
Completely enclosed Dracco Pneumatic Conveyors mean a clean plant, no product contamination, and no material losses.

SPACE-SAVING
A Dracco Pneumatic Conveyor requiring only the space of a 6 inch pipe, releases valuable plant areas for productive use. Vertical heights, horizontal distance, walls, and floors are no obstacles.

GREATER SAFETY
The high operator safety factor possible with a Dracco system is a well-recognized advantage. Safety plus a clean plant provide increased production.

LOW MAINTENANCE
Simplicity and few moving parts reduce maintenance costs to an absolute minimum.

LOWER MATERIAL COST
Another cost-saving feature is that a Dracco system permits buying materials in low-cost bulk form.

Dracco Pneumatic Conveyors are "Performance Proved". High operational efficiency of each installation is assured by exact engineering to individual requirements. If your materials handling problem involves the movement of bulk chemicals, grains, or other granular or powdered materials, you can profit from the advantages provided by Dracco Pneumatic Conveyors.

DRACCO CORPORATION
4040 E. 116th St., Cleveland 5, Ohio
415 Lexington Avenue, New York 17, N.Y.

DRACCO
Performance Proved
PNEUMATIC CONVEYORS

depend on CAMCO
rugged
long-lasting
stainless steel pipe fittings
to solve your
corrosion problems

All screwed Caps, Couplings, Plugs, Bushings and Unions up to and including 2" I.P.S. are machined from solid bar stock.

These fittings — sold at same price as competing 150 lb. cast fittings — can be used where working pressures of up to 1000 lbs. are experienced.

These stainless steel fittings are available in Types 304, 316 and 347.

Write TODAY for the 1951 Camco catalog and price schedules!

CAMCO PRODUCTS

Camco Products
25 Fox Street
New Haven 13, Conn.

Please send your latest catalog.

Firm_____
Street_____
City and State_____
By_____

. . . NEW Heat Saving Efficiency

MUNDET 85% MAGNESIA INSULATION provides maximum strength and resistance to vibration. Extra durability is built into this insulation. In pipe covering and blocks, it is precision manufactured on the latest type of automatic equipment to insure uniform standards. It does not "powder", settle or disintegrate. It is unaffected by steam or water leakage. It maintains an attractive, smooth finish. Precision pipe fit is assured, with no spaces left for the escape of heat. You benefit from the most modern manufacturing facilities for the production of heat insulation when you specify Mundet 85% Magnesia Pipe Covering and Blocks.

See the Mundet Exhibit, Booth 830-831
Exposition of Chemical Industries

Mundet Cork Corporation

Insulation Division, 7111 Tonnelle Ave., North Bergen, N. J.

Mundet district offices are located in these cities:

ATLANTA 239-41 Elizabeth St., N.E.
BALTIMORE 30 612 Battery Ave.
BOSTON 57 Regent St., N. Cambridge 40
CHARLOTTE 3, N. C. 307 S. Cedar St.
CINCINNATI 2 427 West 4th St.
DALLAS 10 601 Second Ave.
DETROIT 21 14401 Prairie Ave.
HOUSTON 1 Commerce and Palmer Sts.
INDIANAPOLIS 4 15 E. Washington St.
JACKSONVILLE 6, FLA. 200 E. Bay St.
KANSAS CITY 7, MO. 1401 St. Louis Ave.
KNOXVILLE 1221 Grand Ave.
LOS ANGELES (Maywood): 6116 Walker Ave.
In Canada: Mundet Cork & Insulation, Ltd., 33 Booth Ave., Toronto
NEW ORLEANS 16 315-25 N. Front St.
NEW YORK 17 331 Madison Ave.
PHILADELPHIA 39 816 N. 48th St.
ST. LOUIS 9 3176 Brannon Ave.
SAN FRANCISCO 7 442 Brannon St.

INSULATION FOR HIGH & LOW TEMPERATURE

BAMAG

80 years

OF PROCESS EQUIPMENT KNOW HOW

now available in the U.S.A.

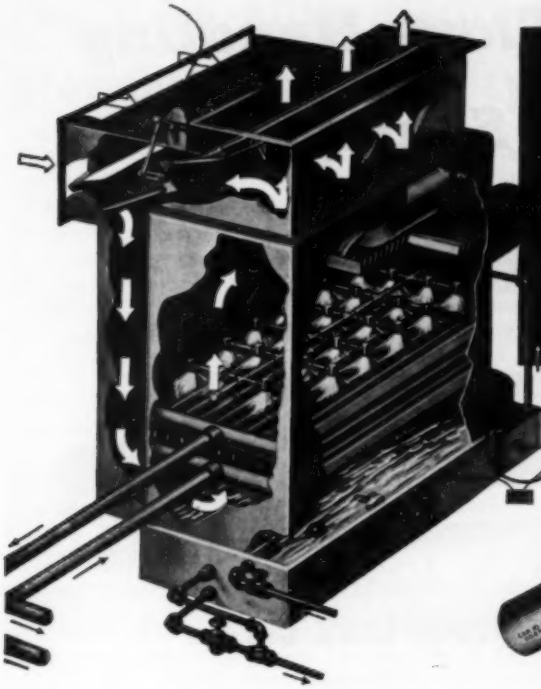
- Nitric Acid Plants
- Fertilizer Plants
- Ammonia Processing
- Natural Fats & Oils Processing
- Electrolyzers for Hydrogen & Oxygen
- Recovery of Sulfur from Petroleum & Gases
- Gas Converters & Generators
- Steam Jet Vacuum Equipment
- Steel Mill Equipment
- Recovery of Waste Pickling Acids
- Water Treatment Apparatus
- Winkler Generators

WRITE FOR DESCRIPTIVE LITERATURE

GENERAL INDUSTRIAL DEVELOPMENT CORPORATION
Exclusive Agents for

BAMAG-MEGUIN
ART ENGINEERING

270 PARK AVE. • NEW YORK 17, N. Y.



Precise temperature control by Niagara Aero Heat Exchangers achieved by Multi-Purpose Thermostat

Fenwal THERMOSWITCH thermostat controls spray water temperature by admitting steam to steam injector — or turning on electric immersion heater to heat spray water.

These exchangers are particularly useful in chemical processes or in cooling quench baths during heat-treating of metals because their constant temperature assures uniform rate and quality in production.

One of the key points in the operation of Niagara Aero Heat Exchangers is precise temperature control of spray water.

To make sure of positive temperature control at all times, Niagara relies on a Fenwal THERMOSWITCH thermostat. This unique, low-cost unit prevents temperature of spray water from dropping below a given point by controlling steam injector or electric immersion heater which supplies additional heat. It also starts the spray pump motor.

These easy-to-install, easy-to-maintain Fenwal THERMOSWITCH thermostats are used to solve all types of control problems. Their activating control element is the single-metal shell that expands or contracts *instantaneously* with temperature changes, making or breaking the totally enclosed electrical contacts.

Find out now how Fenwal THERMOSWITCH units can help you. They effectively control many variables where heat is a factor. Mail coupon below for further information.

"Visit our Booth, 603 at the Chemical Industries Exposition, Grand Central Palace, New York"

Fenwal

THERMOSWITCH

The Precision Multi-Purpose Thermostat Control

SENSITIVE . . . but only to heat

FREE! Get this bulletin . . . see what Fenwal THERMOSWITCH Units can do for you. *Just fill in coupon and mail . . . no obligation.*

FENWAL, INCORPORATED, 1610 Pleasant St., Ashland, Mass.
111 So. Burlington Ave., Los Angeles, Calif.
TEMPERATURE CONTROL ENGINEERS

Name ..... Position .....
Company .....
Street .....
City ..... Zone ..... State .....

I am chiefly interested in the applications checked:

- ☐ Heating
- ☐ Cooling
- ☐ Humidity Control or Detection
- ☐ Alarm (over-temperature, under-temperature)
- ☐ Vapor Control
- ☐ Timing (thermal)
- ☐ Radiant Heat Control
- ☐ Pressure Control (by controlling vapor temperature)

OTHER (Please fill in your special requirements) .....
.....
.....

It's Kid Glove Handling for HALO Shampoo...

in this contamination-proof tank car... built by a.c.f. for Shippers Car Line and leased by them to Colgate-Palmolive-Peet

When the product you move today is destined to glorify a million heads of hair tomorrow... you need extra-special care —and an extra-special car.

Here's how Shippers Car Line and a.c.f. did it. The tank car you see above has a stainless steel tank, polished to a mirror-like finish inside. Between every shipment, two built-in spray heads rinse the tank clean-as-new. The shampoo that comes out is just as pure as the shampoo that goes in.

Shippers Car Line, operator of thousands of tank cars throughout the country, finds these a.c.f. Cars are economical to maintain... safer to run. Whether you're in the market for one special car or a thousand standard ones, you will be interested in the a.c.f. construction techniques that make such long-range savings possible. Write for information: American Car and Foundry Company, 30 Church Street, New York, N. Y. Other Sales Offices: Chicago • St. Louis • Cleveland Washington • Philadelphia • San Francisco.

a.c.f. **ALL-WELDED TANK CARS** *for Safe Delivery—*

The BLAW-KNOX Electro-Vapor® Heating System provides a continuous cycle . . .

This improved method of heat application for the chemical and process industries combines a jacketed reaction vessel of conventional design with an electrically-heated Dowtherm vaporizer, in a single compact unit. Electrical energy is transformed into heat by Blaw-Knox immersion heaters. Dowtherm is vaporized and transfers its latent heat to the inner vessel by condensation. The cycle of vaporization and condensation is continuous, and the fast, uniform, efficient heating inherent in vapor systems is fully realized.

For a brief description of Blaw-Knox Electro-Vapor Heating Systems write for Bulletin No. 2324.

PROCESS EQUIPMENT DEPARTMENT

BLAW-KNOX

DIVISION OF BLAW-KNOX COMPANY

2090 FARMERS BANK BLDG., PITTSBURGH 22, PA.

Other Offices in Principal Cities

DAY AFTER DAY . . .
IN MILL AFTER MILL:

DeZurik Valves Don't Leak!

PROOF keeps piling up of the leak-proof performance of DeZURIK EASY-OPERATING VALVES. In just about every type of mill service, DeZurik's exclusive combination of the Eccentric Principle and the Rubber-Faced Plug stops leaks and keeps them stopped! DeZurik Valves include manual and remote models . . . 1-way to 5-way . . . ½" thru 20" . . . in all metals.

DeZURIK SHOWER COMPANY

SARTELL, MINNESOTA

MADE IN ENGLAND BY MILLSPAUGH, LTD.—SHEFFIELD

A complete steam plant backed by undivided responsibility • Shipped completely assembled • More than 80% thermal efficiency guaranteed • 4-pass design provides 5 sq. ft. of heating surface per b.h.p. • Built-in induced draft eliminates need of expensive chimney • Simple installation • Clean, quiet operation • Heavy-duty construction assures long-lived dependability

Superior Steam Generators are manufactured in 18 sizes from 20 to 600 b.h.p. for pressures up to 250 p.s.i. or for hot water heating.

For complete details, write for Catalog 322

Factory: Emmaus, Pa.

Exec. Offices: Times Bldg, Times Sq., New York N. Y.

Superior STEAM GENERATORS

All These Were Once DUST COLLECTION PROBLEMS, TOO

48 Carbon Black Plants

203 Metallurgical Installations

205 Acid Plants

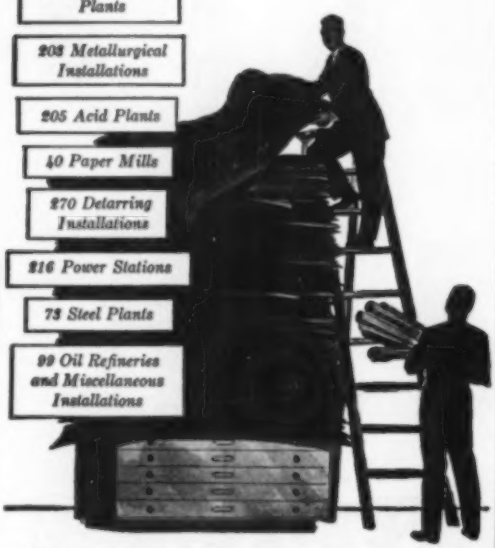
40 Paper Mills

270 Detarring Installations

216 Power Stations

73 Steel Plants

99 Oil Refineries and Miscellaneous Installations



Your electrical precipitator installation will be individually engineered . . . and based on the Research Corporation's *experience* graphically shown by that towering pile of thousands of blueprints.

This knowledge is a valuable asset that will help Research engineers "tailor-make" your Cottrell installation. For example, they can more quickly determine the right answers to such variables as the size, shape and type of both discharge and collecting electrodes, their relative spacing, flue arrangements and many other factors. At Research you can count on *profitable solutions to individual problems.*

Typical One Day Collections

6 TONS OF SODA SALT AT A PAPER MILL

50 TO 100 TONS OF CATALYST

250 TONS OF FLY ASH

10 TONS OF ARSENIC

In one chemical plant, for example, a Research Corporation Cottrell collects 5500 pounds of concentrated sulphuric acid every day. An informative booklet gives valuable information on this and other chemical plant installations. Write for your free copy. RC-117

RESEARCH CORPORATION

405 Lexington Avenue, New York 17, N. Y.

122 South Michigan Avenue, Chicago 3, Illinois

GAYCO CENTRIFUGAL SEPARATORS

GAYCO Separators, equipped with the adjustable centrifugal sizing fan—an exclusive GAYCO feature—make closer separations. Closer separations bring about higher production through efficient removal of the fines made by the mill. Closer separations bring about higher quality products by eliminating all undesirable oversize.

"TIMKEN BEARING EQUIPPED" GAYCO brings you all these:

Range 60 to 400 mesh

Greater capacity

25 to 30% greater production

Cleaner Tailings

Uniform Products

Slow speed for slow wear

Quick and easy adjustments

If you have an exceptionally hard separating problem TRY THE GAYCO

Universal Road Machinery Co.

Rubert M. Gay-Division

Factory and Laboratory, Kingston, N. Y.

119 LIBERTY STREET NEW YORK 6, N. Y

Canadian Representative: F. H. Hopkins & Co., Ltd.

8500 Decaire Blvd. Montreal, Que

WHAT MAKES A MAILING CLICK?

Advertising men agree—the list is more than half the story.

McGraw-Hill Mailing Lists, used by leading manufacturers and industrial service organizations, direct your advertising and sales promotional efforts to key purchasing power. They offer coverage of major markets, including new personnel and plants. Selections may be made to fit your own special requirements.

New names are added to every McGraw-Hill list daily. List revisions are made on a twenty-four hour basis. And all names are guaranteed accurate within two per cent.

In view of present day difficulties in maintaining your own mailing lists, this efficient personalized service is particularly important in securing the comprehensive market coverage you need and want. Ask for more detailed information today. You'll probably be surprised at the low over-all cost and the tested effectiveness of these hand-picked selections.

DIRECT MAIL DIVISION

McGraw-Hill Publishing Company, Inc.

330 WEST 42nd ST. NEW YORK N.Y.

SLY

PIONEERS AND LEADERS IN

DUST CONTROL

These two views show the source of dust in a large chemical plant, the piping leading to the dust filters and the filter itself.

★ NO SALESMEN

We employ no salesmen, but — *mature engineers* are at your service without obligation.

. . . of New York • Chicago • St. Louis • Philadelphia • Minneapolis • Birmingham • Cincinnati • Lansing • Los Angeles • Rochester • Toronto

The proper application of Dust Control Equipment to your needs is definitely a science.

Your Sly Engineer, backed by an experienced technical staff at the home office, brings that science to your door.

The know-how of dust control is not found in print — it is gained only by experience. With over 50 years' experience in this field, involving thousands of installations in practically all industries, we have an exceptional background which can be of great value to anyone with a dust problem.

Yet–Sly costs *no more* (sometimes *less*). May we send you Bulletin 98 and discuss your problem with you?

THE W. W. SLY MANUFACTURING CO.

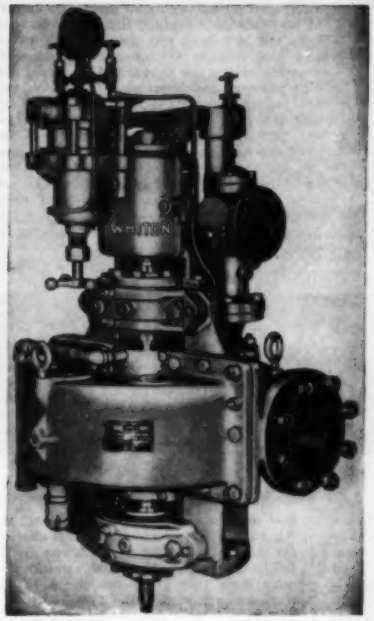
4771 Train Avenue • Cleveland 2, Ohio

New York • Chicago • St. Louis • Philadelphia • Minneapolis • Birmingham • Cincinnati • Lansing • Los Angeles • Rochester • Toronto

Whiton

SOLID STEEL ROTOR

STEAM TURBINES



VERTICAL TURBINE DRIVES

for

ECONOMICAL

and

DEPENDABLE

Operation of

- PUMPS
- FANS
- COMPRESSORS

Whiton Vertical Turbines, Available in various types and frame sizes up to 600 Horsepower.

Solid Steel Rotor design assures high efficiency for low-speed, direct drive.

Where dependable vertical drive is required . . . use Whiton.

Send for complete information

Whiton SINCE 1856

WHITON MACHINE CO.

NEW LONDON 14, CONN., U.S.A.

Literally THOUSANDS of facts to aid you in chemical plant ENGINEERING • OPERATION • MANAGEMENT

AT LAST—
A thorough, dependable Library for every man in the chemical industries.

5 practical volumes

1. Selected Process Industries
2. Chemical Engineering for Production Supervision
3. Materials of Construction for Chemical Process Industries
4. Manual for Process Engineering Calculations
5. Chemical Engineering Economics

USE this newly-combined set of data-packed McGraw-Hill books as a real time-and-work-saving tool . . . as an up-to-date library of management, engineering, and operating facts that can help you quickly solve everyday problems in the chemical process industries. Here are thousands of clear, concise pointers on chemical calculations, economics, unit operations, industrial chemistry, and materials of construction . . . the kind of information you want and need if you are to *improve your skill and earning power* . . . the specific instruction that can aid you in doing things *better, quicker, cheaper.* And you may see these books—start using them *at once*—and pay only in small monthly installments while the books are working for you.

The NEW

McGraw-Hill CHEMICAL PLANT LIBRARY

5 volumes • 2359 pages • 975 illustrations

James A. Lee, Consulting Editor
Prepared by a Staff of Experts

NO books dealing with the work of the chemical plant man were ever so complete—so authoritative—so plainly worded and clearly illustrated as these. The fundamentals, methods, and data it presents are accurate, thorough, complete. The Library is the result of years of experience with chemical plant problems, *and the man who has it has the best.* Turn to it for today's latest procedures used in manufacturing chemicals and chemical products . . . for clear instructions in operating chemical plant equipment . . . for specific aid in selecting corrosive-resistant construction materials . . . for tested design data that can help you speed up and simplify your calculations when designing chemical processes . . . or for scores of practical business helps on cost accounting, investment, pricing, etc. All of this information has been checked for dependability by an authority in the field—arranged in the handy, quick-reference form that gives you the help you need when you need it.

Here's the kind of how-to, problem-solving help this library gives you:

- A cross section of the manufacturing procedures employed by modern chemical industries, largely separated into their unit processes and operations by flow charts
- Real, on-the-job assistance in making the plant or units in your charge operate at peak efficiency
- Tested facts on 500 different chemicals and feed stuffs to help you select construction materials—used in production, handling, and packaging operations—that resist chemical corrosion most effectively
- A wealth of practical data to short-cut your work with process engineering calculations—from the research report stage to the final design stage
- Dozens of tips on the business side of chemical engineering, including information on everything from the cost of equipment, to economical energy utilization

SEND NO MONEY

Examine these books yourself—FREE

You must inspect these 5 books yourself in order to realize their on-the-job value to you. Just mail the coupon below and we'll send you the Library for 10 days' free examination. After 10 days you are free to return the books without obligation . . . or, if you decide to keep them, to pay in easy monthly installments as outlined below.

10 DAYS' FREE EXAMINATION

McGraw-Hill Book Co., Inc.,
330 W. 42nd St., New York 18

Send me the McGRAW-HILL CHEMICAL PLANT LIBRARY, 5 volumes, for 10 days' examination on approval. If the books prove satisfactory, I will remit $4.00 in 10 days, and $5.00 monthly until $24.50 is paid. Otherwise I will return books postpaid.

(Print)
Name .....
Address .....
City ..... Zone..... State.....
Company .....
Position CE-10-51

This offer applies to U. S. only

ACCURATE METERING

Almost any Liquid or Volume

NIAGARA METERS

From 1/30 to 1000 gallons per minute can be accurately metered by performance-proven NIAGARA Meters. Nutating piston principle combines large capacity with slow-flow sensitivity. Sizes range from ½" to 6" diameter. There are meters for oils, chemicals, cold or hot water and many other liquids. Investigate them today by sending coupon below for complete details.

Please send me information on the complete line of Niagara Meters.

Liquid .....
Flow g.p.m. .....Temp.....°F
Name .....
Company .....
Address .....

BUFFALO METER CO.
2892 MAIN STREET
BUFFALO, N. Y.

BY USING

ANTHRAFILT*

The Hard Coal Filter Medium

You SAVE in many ways when you use ANTHRAFILT* . . . regardless of whether you filter acetic and sulfuric acid, or caustic soda solutions, boiler condensate, sanitary or process water!

ANTHRAFILT*

Provides

- GREATER CAPACITY
- LONGER FILTER RUNS
- CLEANER WASHINGS AT LOWER COST
- REMOVES ENTRAINED TURBIDITY FROM INDUSTRIAL PROCESS SOLUTIONS OR WASTES

In every sense ANTHRAFILT* is an outstanding hard coal filter, proved by widespread use in industry. NO water soluble constituents remain in ANTHRAFILT* to contaminate or contribute tastes or odors to filtered solutions. The reason: practically *all* minerals other than the inherent ash has been removed during its preparation.

You are invited to write us today for full details and recommendations. A prompt reply is assured.

PALMER FILTER EQUIPMENT COMPANY
822 East 8th St., P. O. Box 1655, Erie, Pa.
*Trade Mark Reg. U. S. Pat. Off.

ANTHRACITE
EQUIPMENT CORPORATION
Anthracite Institute Building
WILKES-BARRE, PA.

A&A

PLATINUM

GOLD AND SILVER

for the chemical + metallurgical industries

Sheet, Wire, Tubing, Gauze and Fine Foils.

Platinum Metal Catalysts—Concentrated forms and on carriers.

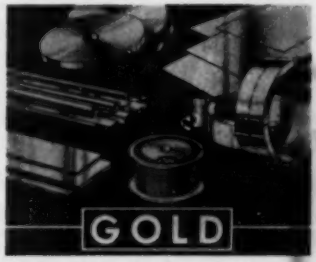
Salts and Solutions.

Stills, Retorts, Electrodes and other Special Process Equipment to order.

Laboratory Wares of all description.

Palladium, Iridium, Osmium, Rhodium and Ruthenium.

We pay highest prices for scrap platinum and have facilities for prompt recovery of spent platinum and palladium catalysts.



Sheet, Foil and Ribbon, pure and in alloy. Seamless Tubing. Laboratory Apparatus and Process Equipment.

Karat Golds. Fine Gold Anodes.

Fine, Sterling and Coin. Sheet, Wire, Circles and Foil.

Fine Silver Anodes. Rolled, Cast or in Shot Forms.

Silver Brazing Alloys and Fluxes for every industrial requirement.

WE INVITE YOUR INQUIRIES AND WILL SEND ON REQUEST FOLDERS:
C-20, *"Platinum, Gold and Silver for Science, Industry and the Arts"*
C-21, *"Platinum and Palladium Catalysts"*.

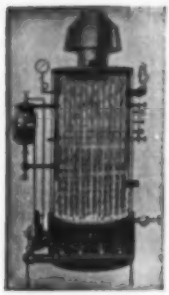
THE AMERICAN PLATINUM WORKS

PRECIOUS METALS SINCE 1875

231 NEW JERSEY R.R. AVE.,
NEWARK 5, N. J.

"UNITIZED" STEAM?

ECONOMICAL ANSWER . . .
the KANE BOILER PACKAGE



The KANE Boiler, built to A.S.M.E. specifications. In sizes to 30 H.P.

Here's a truly "unitized" steam supply—a compact, self-contained BOILER PACKAGE that is completely automatic . . . requires no attendant and only a bare minimum of floor space. The KANE BOILER PACKAGE includes: the correctly sized Automatic Gas-Fired Boiler complete with gas burner and controls to maintain required steam pressure; and an M-K-O Automatic Boiler Feed system designed to return condensate and supply make-up water as required for highest operating efficiency.

Engineered Steam at its best with four decades of experience at your disposal—so, send your steam problem to us for study and recommendation.

The M-K-O Automatic Boiler Feed returns condensate and supplies small quantities of hot water as needed to the KANE Boiler.

ENGINEERED STEAM AT ITS BEST

MEARS-KANE-OFELDT INC.

P. O. BOX 223 BRIDGEPORT, PA.

FOUR DECADES OF AUTOMATIC GAS-FIRED BOILER MANUFACTURING EXPERIENCE

THE KELLEX CORPORATION

ANNOUNCES its new name,

VITRO CORPORATION OF AMERICA

effective August 31, 1951.

Organization, policies and services continue as before.

RESEARCH · DEVELOPMENT · DESIGN

VITRO CORPORATION OF AMERICA

233 BROADWAY, NEW YORK 7, N.Y.

CASE HISTORY SERIES

BLENDING FOR BRIQUETTES

An RDH-18 Rietz Disintegrator with 4 HP being used for premixing hot dry carbon black, hot asphalt, and water ahead of briquetting presses at capacities in excess of 3 tons per hour in a continuous circuit producing the homogeneous blend instantly and completely which is required for this difficult application.

Write for free technical bulletin on this application.

Equipment for the food and processing industries

Rietz MANUFACTURING CO.

180 Todd Road, Santa Rosa, California

McGraw-Hill *Directory of* Chemicals *and* Producers

Enlarged, Completely Revised Second Edition

The *Only* Chemical Directory that:

confines itself to producers and manufacturers exclusively

shows grades and purities separately, carries completely impartial listings. An unprecedented market research work covering the American chemical industry, listing:

CHEMICAL RAW MATERIALS
INDUSTRIAL CHEMICALS
FINE CHEMICALS
DYESTUFFS
INTERMEDIATES

and their Producers and Manufacturers with certified information for each individual grade including Synonyms, Trade Names, Form, Packing, Shipping Regulations, Shipping Points, Approx. Number of Employees.

This edition contains also Names & Titles of Key Executives

Price: $20 per copy

"Should be in every plant library" TAPPI
"Long needed index" MODERN PLASTICS
"An absolute necessity for everyone dealing with the purchase of chemicals" THE CHEMIST
"A Must" CHEMICAL ENGINEERING
"A great time-saver" ARCHIVES OF PHYSICAL MEDICINE
"Of particular value in saving time, labor and money" JOURNAL OF COMMERCE

McGraw-Hill Directory of Chemicals and Producers
Dept. A, 330 West 42nd Street
New York 18, N. Y.

Please send me postpaid my copy of the McGraw-Hill Directory of Chemicals and Producers, Second Enlarged Edition:

Name .....
Company .....
Address .....
City ..... State.....
☐ I am enclosing $20 check
☐ Please bill me

NERCO-NIRO *The Engineered* Spray Dryer

Over 200 installations in 25 countries

FLEXIBILITY of operation

For most spray drying applications in the chemical industries NERCO-NIRO is the answer.

Backed by more than 20 years of extensive research.
Easy to clean—easy to operate.
Low production and maintenance cost.
Reliable performance and non-clogging atomizer.
Complete recovery of solids without the use of filters or wet scrubbers.
Laboratory facilities available for test purposes.

Recent installation in U.S.A. shown at extreme right.

Typical Nerco-Niro Spray Dryer flow diagram.

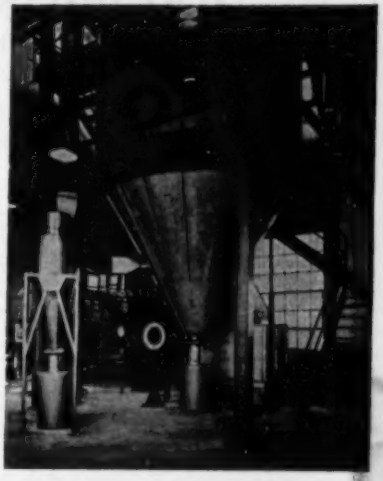


Photo Courtesy J. T. Baker Chemical Co., Phillipsburg, N. J.

CANADIAN OFFICE
1477 Sherbrooke St., W.
Montreal 25

NICHOLS ENGINEERING & RESEARCH CORP.
NERCO-NIRO SPRAY DRYER DIVISION
70 PINE STREET, NEW YORK 5, N. Y.

PACIFIC COAST OFFICE
40 S. Los Robles Avenue
Pasadena 1, Calif.

ACID-PROOF CONSTRUCTION
SAUEREISEN ACID PROOF CEMENTS
Years of dependable service in leading steel mills, chemical plants, etc.
Write for new catalog
Sauereisen Cements Company Pittsburgh 15, Pa.

WHERE TO BUY

Featuring additional Equipment Materials, Supplies and Service for the Process Industries

Reduce Costly Down-Time With . . . .

HEIL Acid-Proof Pipe

Complete Facilities for Fabrication and Lining with

• RUBBER • LEAD • PLASTIC

Representatives in Principal Cities

HEIL Process Equipment Corp.
12901 ELMWOOD AVENUE
CLEVELAND 11, OHIO

DRYERS and KILNS . . .

For all purposes

W. P. HEINEKEN
Engineer & Manufacturer

50 BROAD ST.
New York, N. Y.

STAINLESS STEEL and MONEL UTENSILS

High-quality corrosion resistant utensils for laboratory and plant. All items shown, plus beakers, batch cans, stockpots and shovels, in stock for prompt shipment.

Write for latest Catalog—Price List

METALSMITHS Div. of Orange Roller Bearing Co., Inc.
564 White St., Orange, N. J.

FEED MATERIAL BY WEIGHT

THE MERRICK FEEDOWEIGHT

MERRICK SCALE MFG. CO.
171 SUMMER ST., PASSAIC, N. J.

CHEMSTEEL CONSTRUCTION COMPANY, INC

581 Chemsteel Bldg. Walnut St. Pittsburgh 12, Pa.

Send data on Engineering & Construction facilities for **ACID-ALKALI-PROOF CONSTRUCTION** of processing & storage tanks & flooring.

NAME .....
COMPANY .....
ADDRESS .....
CITY .....ZONE.....STATE.....

PROFESSIONAL SERVICES

PATENTS · REPORTS · TESTING · PLANT DESIGN · INVESTIGATIONS · GENERAL CONSULTING · RESEARCH · MANAGEMENT · TRANSLATIONS

CHEMICAL AND BACTERIOLOGICAL ANALYSIS

R. S. ARIES & ASSOCIATES
Chemical Engineers & Economists
COMMERCIAL CHEMICAL DEVELOPMENT
Process Analysis • Market Research
Surveys—Technical and Economic
Design & Initial Operation of Complete Plants
Licensing of New Processes & Products
New Product Development
400 Madison Ave. EL-5-1430 New York 17, N. Y.

Consult these SPECIALISTS
Let them save your time by bringing their broad experience in their specialty to bear on your problems.

GUSTAVE T. REICH
Consulting Chemical Engineer
DEVELOPMENTS — OPERATION
CARBOHYDRATES INDUSTRY — BY-PRODUCTS
CARBON-DIOXIDE — WASTE DISPOSAL
Packard Building Philadelphia, Pa.

W. L. BADGER
CONSULTING CHEMICAL ENGINEER
Evaporation, Crystallization, and Heat Transfer; Complete plants for salt and caustic soda; Complete Dowtherm installations.
209 South State Street Ann Arbor, Mich.

GEORGE H. KENDALL
Consulting Mechanical Engineer
Cost Reduction Studies; Process or Product Redesign Existing Products for Greater Profit. Trouble Shooting Production, Design, Cost Problems. Specialist Automatic Machinery, Processes, Controls, New Developments, Patent Studies, Investigations New Products & Process Engineering Studies
P. O. Box 2 (Est. 1923) Tel. Darien 5-1504
Norton Heights Darien, Connecticut

W. H. RICE COMPANY
Engineers — Consultants
Plant Design - Building -
Materials Handling - Piping -
Process Equipment - Heating & Vent.
37 Beechwood Road Summit, N. J.

J. PAUL BISHOP AND ASSOCIATES
Consulting Food and Chemical Engineers
Specializing in:
Designing, Estimating and Engineering of New and Modernizing of Old Food and Chemical Plants and Processes.
Internationally Known.
Write P.O. Box 244
Champaign Illinois

KNOWLES ASSOCIATES
Chemical—Metallurgical—Mechanical Engineers
Consultation — Design
Complete Plants — Equipment
Cement — By-Product Foods — Phosphates
Starch — Drying — Classification
Dewatering
19 Rector Street New York 6, New York
Bowling Green 9-2458

SANDERSON & PORTER
Engineers and Constructors
New York • Chicago • San Francisco

CARL DEMRICK
Technical Translations
Send for Circular
55 So. Broadway Yonkers, N. Y.

KOHN & PECHENICK
Consulting Chemical Engineers
Plants — Process — Equipment
DESIGN
Reports Trouble-Shooting Appraisals
302 Hazen St. Brooklyn 22, N. Y.

J. E. SIRRINE COMPANY
Engineers
Plant Design & Surveys covering Chemical, Electrochemical and Metallurgical Production; Trade Waste Disposal; Water Supply & Treatment; Analyses & Reports.
Greenville - - - - - - - - South Carolina

RICHARD F. ENNIS, JR.
Consulting Chemical Engineer
Engineering and Economic Studies
Design—Development—Research
Lincoln-Liberty Bldg., Philadelphia 7, Pa.

THE KULJIAN CORPORATION
Engineers • Constructors
1200 North Broad Street, Philadelphia 21, Pa.
Washington, D. C. • Rome, Italy • Calcutta, India
Caracas, Venezuela • Mexico City, Mexico

MARCUS SITTENFIELD
Consulting Chemical Engineer
Plants - DESIGN - Equipment
Economic - SURVEYS - Technical
Process - DEVELOPMENT - Product
Registered Professional Engineer
1411 Walnut St. Philadelphia 2, Pa.

EVANS RESEARCH AND DEVELOPMENT CORPORATION
Organic and Inorganic Chemistry Processes—Products
250 East 43rd St. New York 17, N. Y.

JACKSON D. LEONARD
Consulting Chemical Engineer
Cost Reduction Programs for the Process Industries
Maintenance Programs — Utility Conservation
Suggestion Systems—Cost & Economic Analysis
Process Design — Process Improvement
80 Spring Street Metuchen, N. J.

FOSTER D. SNELL, INC.
Research Chemists and Engineers
A staff of 75 including chemists, engineers, bacteriologists and medical personnel with 10 stories of laboratories and a pilot plant are available for the solution of your chemical and engineering problems.
Write today for Booklet No. 3
"The Chemical Consultant and Your Business"
29 West 15th St. New York 11, N. Y.

FRASER-BRACE ENGINEERING CO., INC.
Design Engineers & Constructors
of
Hydro-electric Developments
Metallurgical, Explosives, & Industrial Plants
Chemical & Process Industries
Railroads — Tunnels — Port Facilities
10 East 40th St., New York 16, N. Y. Lex 2-5570

C. L. MANTELL
Consulting Chemical Engineer
Process Research and Engineering
Development
457 Washington Street New York 13, N. Y.

NICOLAY TITLESTAD CORPORATION
Chemical Engineers
Design — Consultation — Complete Plants
sulphuric acid — phosphoric acid
nitric acid — oxidation of ammonia
nitrogen products — acid concentration
surplus dioxide — carbon bisulphide
11 W. 42nd Street, N. Y. 18 PE-6-6010

INTERNATIONAL ENGINEERING COMPANY INC.
Engineers
Investigations — Reports — Design
Procurement — Field Engineering
Domestic and Foreign
74 New Montgomery St. San Francisco 5, California

MELVIN NORD, DR. ENG. SCI., LL.B.
Consultant in Legal and Technical Problems
REGISTERED PROFESSIONAL ENGINEER
CHEMICAL ENGINEER
PATENT ATTORNEY
884 Pitman Detroit 1, Mich.

THE J. G. WHITE ENGINEERING CORPORATION
Design - Construction - Reports - Appraisals
80 Broad Street, New York 4

FOR SALE
IMMEDIATELY AVAILABLE

Suitable for Chemical or Related Processes

OFFERING THE FOLLOWING VITAL FEATURES

WOONSOCKET, RHODE ISLAND

FLOOR SPACE 250,000 Sq. Ft.
CONSTRUCTION Brick, completely sprinklered
SHIPPING AND RECEIVING Railroad Sidings and Off Street Truck Loading Platforms
STEAM PLANT Modern 1000 HP (normal rating) in 2 Heine Water Tube Boilers—arranged for oil and pulverized coal firing
REFRIGERATION 300 Tons 2 Synchronous Motor Drive Units, with complete accessories
WATER SUPPLY Approximately 6,000,000 gallons daily fresh water available
WATER TREATMENT Complete Filtration and Softening Plant
PIPING All installed for steam, air, water, brine
AIR CONDITIONING Units installed ranging up to 130,000 CFM
TANK STORAGE 130,000 gallon Tank—40,000 gallon Fuel Oil Tank—30 Miscellaneous Jacketed and Non-Jacketed Tanks (all piped up)
OFFICE BUILDING AND LIBRARY 2-Story Modern Building with Partitions, Fluorescent Lights, 2 Vaults
ELEVATORS 3—Otis Elevators—2,000#—4,000#—6,000# capacity
MACHINE SHOP—CARPENTER SHOP—STORE ROOMS Well equipped with tools and supplies
CHEMICAL LABORATORY Fitted with Benches, Hood, Sinks, etc.
LOCATION Woonsocket is 24 miles from Worcester, Mass.—22 miles from Boston, Mass.—14 miles from Providence, R. I.—75 miles from Hartford, Conn.—Overnight by Truck Deliveries for New York and New Jersey

THE TOTAL AREA COMPRISES APPROXIMATELY 74 ACRES WITH SEWERS, FIRE LOOPS (AROUND ENTIRE PROPERTY) WATER LINES, ETC.—LANDSCAPED AND FENCED BY A 7' CYCLONE WIRE FENCE.

WAVERLY, IOWA

FLOOR SPACE 50,000 Sq. Ft.
CONSTRUCTION Brick & Concrete
STEAM PLANT Modern 500 HP Water Tube Boiler, stokered
WATER SUPPLY Total capacity 4 — 12" wells, motor driven Pumps—approximately 3000 G.P.M.
PIPING All installed for Steam, Air, Water
WASTE DISPOSAL Ample facilities to meet Iowa State Requirements
SHIPPING & RECEIVING 2 Railroad Sidings for 30 cars.

At present Plant has installed a Double Shell rotary Dryer. Air Compressors. Ion Exchange Water Treatment equipment, Pumps. 750 KVA Non-Condensing Uniflow Engine generator set.

LOCATION Waverly is 19 miles from Waterloo, Iowa.

TOTAL AREA COMPRISES APPROXIMATELY 25 ACRES, WITH SEWERS, WATER LINES, ETC.

PROMPT INSPECTION IS SUGGESTED

Write, Wire, Phone

BROKERS PROTECTED

CONSOLIDATED PRODUCTS COMPANY, INC.
AS AGENTS

15 PARK ROW NEW YORK 38, N. Y.
BArclay 7-0600

At Your *BUSINESS* Service!

American Machinist
Aviation Week
Business Week
Bus Transportation
Chemical Engineering
Chemical Week
Coal Age
Construction Methods & Equipment
Electrical Construction & Maintenance
Electrical Merchandising
Electrical World
Electronics
Engineering & Mining Journal
E. & M. J. Metal & Mineral Markets
Engineering News-Record
Factory Management & Maintenance
Fleet Owner
Food Engineering
Nucleonics
Power
Product Engineering
Textile World
Welding Engineer

Hundreds of miscellaneous business problems that confront you from time to time can be easily and quickly solved through the use of the Searchlight Sections of this or other McGraw-Hill Publications.

The Searchlight Section is the Classified Advertising Section appearing in each of these publications. You can use it at small cost to announce all kinds of business wants and needs to other men in the fields served by them.

When you want additional employees, want to buy or sell used or surplus new equipment, want additional products to manufacture, seek more capital—in fact, for almost any business need or want, put the Searchlight Section to work for you.

Classified Advertising Division

McGRAW-HILL PUBLISHING CO., Inc.
330 WEST 42nd ST. NEW YORK 18, N. Y.

Additional Searchlight Advertising on pages 430-441

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:
$1.20 a line, minimum 3 lines.
To figure advance payment count 5 average words as a line.
POSITION WANTED—INDIVIDUAL SELLING OPPORTUNITY undisplayed advertising rate is one-half of above rate, payable in advance.
PROPOSALS, $1.20 a line an insertion.

INFORMATION
BOX NUMBERS count as one line additional in undisplayed ads.
DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).
EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

DISPLAYED RATE:
The advertising rate is $11.80 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request. AN ADVERTISING INCH is measured 7/8 inch vertically on one column, 3 columns—30 inches—to a page. C. E.

NEW ADVERTISEMENTS received by 10 A.M. November 1st at the New York Office, 330 W. 42nd St., New York 18, N. Y., will appear in the November issue subject to limitations of space available

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

ASSISTANT HYDRAULIC Engineer with some field experience in construction of hydro-electric power plant projects etc. for large Copper Company, Chile, South America. Civil Engineering graduate preferred. 2-year contract. Transportation both ways and salary while traveling paid by Company. In reply give complete details. P-1992, Chemical Engineering.

CHEMIST OR Chemical Engineer for Research and Development in industrial thermo-setting laminated plastics. Five to ten years of experience in the field of adhesives, varnishes, and synthetic resins preferred. Location Eastern New York. Please state education, experience, references, salary desired and photo, if available, with initial letter. P-2175, Chemical Engineering.

ASSISTANT MILL Metallurgist for large Copper Company, Chile, South America. Young college graduate with some experience, to work in Mill Metallurgical laboratory. 3-year contract. Transportation both ways and salary while traveling paid by Company. In reply give complete details. P-1995, Chemical Engineering.

CHEMIST REQUIRED as permanent addition to staff of an industrial Development Department, company located in Minnesota. Program relates to new products and processes using wood as a principal raw material. Knowledge of paint technology an asset. Recent graduate or man with 1-3 years experience preferred. Submit details education, experience, references, salary requirement, photo, draft status. P-1946, Chemical Engineering.

CHEMIST WITH executive ability, knowledge of paints, pigments, & allied lines to assist chief chemist in manufacturing plant St. Louis area. Excellent opportunity; write stating qualifications fully, including salary expected. P-1976, Chemical Engineering.

ENGINEER TO solve corrosion problems in process equipment and plant maintenance by proper metal selection, protective coatings, fabrication procedures. 5 to 10 years experience plus B.S. or M.S. in Chemical, Metallurgical or Mechanical Engineering desired. Position is with stable, well established, consumer products industry in East. Salary Open. State complete details of experience, responsibility carried, and age, in first letter. P-2143, Chemical Engineering.

WANTED IMMEDIATELY, Chemical Engineer with process design and estimating experience in the field of Soda-Ash Plants. Good pay and pleasant working conditions. Write full particulars to Box P-1797, Chemical Engineering.

WANTED: SEVERAL Chemical Engineers, graduates of recognized schools, to do process development production work in heavy chemicals by large Florida Chemical manufacturer. Address reply to P.O. Box 2269, Tampa 1, Florida giving full details including education, experience, photograph and salary desired, in first letter.

SELLING OPPORTUNITIES OFFERED

MIDWEST MANUFACTURER of complete line of Blowers seeks representation. RW-2052, Chemical Engineering.

EDITORS WANTED

To carry out expanding editorial services, CHEMICAL WEEK wants additional staff men with qualifications as follows:

Associate Editor, chemical or preferably chemical engineering training; at least 5 years industrial experience; ability to write.

Editorial Assistant, Bachelor's degree in chemistry or chemical engineering; journalism courses or writing experience helpful.

If interested in either of these opportunities, submit in confidence details of education, experience, salary requirements, etc., by mail only to: S. D. Kirkpatrick, Editorial Director,

CHEMICAL WEEK
330 W. 42nd St., New York 18, N. Y.

SELLING OPPORTUNITY WANTED

MOLDER OF Teflon shapes requires resident representative for sale of our product on commission basis to Chemical and Petro-Chemical Plants, Aviation, Electronic and Radar projects in the following trade territories: Rio de Janeiro, Buenos Aires, Mexico City and Caracas. RW-2001, Chemical Engineering.

EMPLOYMENT SERVICES

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 41 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 200 Dun Bldg., Buffalo 2, N. Y.

SALARIED PERSONNEL $3,000-$25,000. This confidential service established 1927, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. B, 241 Orange St., New Haven, Conn.

POSITIONS WANTED

ANALYTICAL CHEMIST, Middle-aged, Versatile Experienced, metals, ores, ceramics, organic, electroplating. PW-1967, Chemical Engineering.

ANALYST: EXPERIENCED ores, steel and alloys. Laboratory or production Chemist. PW-1588, Chemical Engineering.

CHEMICAL ENGINEER with twenty-five years experience in Glass Manufacturing as Manager and Executive now open for engagement full time, part time, permanent or temporary. PW-1557, Chemical Engineering.

SALES MANAGER: Heavily experienced in Water Treatment Equipment, Steam Power Plant Boilers and Accessories. Graduate Engineer. 13 years experience. Free to travel. PW-2078, Chemical Engineering.

CONTRACT WORK

Custom grinding
Well-established company in New Jersey offers facilities for fine grinding of metallics and non-metallics to flake, chip and grain forms. Specialists in hazardous products. Packing, mixing and shipping facilities available. CW-1956, Chemical Engineering.

PATENTS

CONSULT: Z. H. POLACHEK,
Reg. Patent Attorney, 1234 Broadway, New York 1, N. Y.

FILTRATION SALES ENGINEER

Nationally known manufacturer of Pressure Filters seeks engineer to cover Metropolitan New York Industry. Our filters already widely installed and fully recognized in area. Applicants should possess sound sales and equipment background. Prior filtration experience desirable. Salary and Commission. State full personal history, qualifications and salary requirements. All replies held confidential.

P-2117, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

CONSTRUCTION SUP'T & ENGINEER

Technical college graduate, well-experienced in building construction and installation of equipment; willing to travel to locations in United States. State age, salary expected, experience in detail, and date available to begin work. Write, Box CE 1157, 221 W. 41 St., N. Y. 18

DEVELOPMENT ENGINEER

Established medium-size chemical company has challenging opportunities for development engineers to work on continuous long range expansion program. Assignments include design and evaluation of new processes and equipment; improvement of yield and quality on existing processes. Bachelors degree in Chemical Engineering plus several years industrial experience or Masters degree and at least one year's experience.

P-2104, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

ENGINEERS

CHEM. ENG'R. dog., strong industrial.....
"paper" exp. $7,500
CHEM. ENG'R. dog., design.....$6,500
JR. CH. ENG'RS. dog., design.....$3,900
Many Metallurgical Positions
Call, write or wire: GLADYS HUNTING
DRAKE PERSONNEL
7 W. Madison St. Chicago 2, Ill.

SALES REPRESENTATION AVAILABLE

One of our clients—an established sales engineers in Chicago and Mid West—is interested in additional accounts for equipment used by the Steel, Chemical, Oil and General Industries.
Please address inquiries to:
First United Broadcasters,
201 North Wells St., Chicago 6, Illinois

MANUFACTURER'S REPRESENTATIVE

covering New York State desire agency for instruments, mechanical handling or process equipment saleable to food, chemical, steel and process industries. Seasoned chemical and mechanical engineers with design and sales experience in their respective fields.

RA-1909, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

WANTED MILLING FACILITIES

Chemical manufacturer requires services milling or grinding machinery to produce powdered natural products which are harmless and practically odorless. Fee or rental basis under contract. Mills to produce 100/200 mesh material without dehydration. Maximum moisture crude products 15%. Write fully.

CWA-2043, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

Business Opportunity & Wanted Advertising on page 432

ENGINEERS

Chemical - Mechanical - Piping - Process

Long term openings in permanent offices located at Cleveland, Ohio and Frederick, Maryland offering good salary plus overtime (forty eight hour week) for qualified Engineers, Group Leaders and Designers experienced in one or more of the following phases of industrial plant design:

PROCESS PIPING
INSTRUMENTATION
PROCESS EQUIPMENT LAYOUT
PACKAGING
AIR CONDITIONING
PLUMBING
TANKS AND VESSELS
BOILER HOUSES
PLANT LAYOUT
CONVEYORS
HEATING AND VENTILATION
SPRINKLERS
WATER TREATMENT

Limited number of openings for Estimators experienced in Mechanical and Chemical installations as well as building construction.
Also have a number of openings in our Cincinnati and New York City offices for similar type personnel.
Excellent working conditions with paid vacations, sick leave plan and participating Group Insurance Program.
Please submit complete resume stating experience, education, salary required and date available to:

The H. K. Ferguson Company
Engineers and Builders
Ferguson Building — Cleveland 14, Ohio

VISCOSE ENGINEER

National organization seeks capable graduate engineer with minimum 5 years experience in viscose rayon manufacture. Headquarters New York. Salary high.

Send complete resume including age and salary data

Box CE 1289, 221 W. 41 St. — New York City 18, N. Y.

WANTED

Construction Engineer

(Mechanical or civil) for process plant. Experienced in heavy construction, including buildings, piping, and machinery installation.

Also, Design Engineer

(Mechanical or civil) for process industry. Familiar in heavy industry plant construction, including design, equipment specifications, and machinery installations.
These positions in modern, expanding plant in northern Ohio River valley. Attractive insurance and pension plans, desirable community, excellent opportunities for competent men.

P-1786, Chemical Engineering
330 W. 42nd St., New York 18, N. Y.

KAYLO INDUSTRIAL INSULATION SALES ENGINEER

We require the addition of a capable, qualified, interested sales engineer in our Kaylo Products Division, who is free to relocate. Experience in high temperature applications essential. Age 25-45. Engineering background required. Salary commensurate with ability.

Write full particulars to
J. A. SWEENY, *Director*,
Selection of Specialized Personnel
OWENS-ILLINOIS GLASS CO.
P. O. Box 1035, Toledo 1, Ohio

CHEMICAL ENGINEER

Large Western New York synthetic organic chemical plant, noted for its high-quality manufacturing standards, has attractive permanent position for chemical engineer with 2 to 3 years' industrial experience on plant engineering projects. Liberal starting salary, with periodic review of performance for salary increases. Excellent working conditions, cafeteria, pension plan, plus group life, sickness and accident insurance. Reply in confidence to: Superintendent of Personnel Relations,

P-1978, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

PRODUCTION SUPERVISION

Rapidly expanding, medium-size company engaged in chemical, rubber, and plastics operations has several production supervisory openings with excellent potential for advancement. Engineering degree necessary. Business Administration training and/or industrial experience desirable.

P-2168, Chemical Engineering
330 W. 42nd St., New York 18, N. Y.

Ch. E. WANTED

Ten Years Experience handling bulk chemicals and Labor Problems.
Position: Ass't Plant Supt. Excellent Opportunity.
Location: Southwest.

P-2118, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

Plant & Maintenance Engineer

Experienced, for work in continental United States. Some traveling necessary. State salary expected, age, experience and date available for work. Write

Box CE 1158, 221 W. 41 St., NY 18

RESEARCH DIRECTOR:

Career opportunity for Chemical Engineer or Chemist to establish and head up research department responsible for product improvement, new product development, also process development of Three paper mills producing Kraft and Sulphite Converted Products.

P-2074, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

OPPORTUNITIES FOR EXPERIENCED ENGINEERS

in

ATOMIC ENERGY INSTALLATIONS

at

Oak Ridge, Tennessee and Paducah, Kentucky

AIR CONDITIONING, HEATING AND VENTILATING—Design, installation, and maintenance of plant systems.

CONSTRUCTION—Plant design and construction, coordination of procurement and installation of process equipment.

DESIGN - DRAFTING — Chemical plants, structures, piping, utilities, alterations.

INSTRUMENTATION — Design, development and industrial application of electronic and pneumatic instruments.

MACHINE DESIGN—Jigs, fixtures, gadgets, remote control equipment.

NUCLEAR REACTORS—Chemical and Mechanical Engineers for design, development and construction.

POWER—Design, testing, construction of large electrical power generation and distribution installations.

PROCESS—Chemical process and equipment design, vacuum or high pressure systems, pilot plant operation.

SAFETY — Welding inspection, hoist and vessel inspection, fire protection.

Salary commensurate with training and experience

Give experience, education, age, references, personal history, salary received and salary expected.

Central Technical Personnel Office
Carbide and Carbon Chemicals Company
a Division of

UNION CARBIDE AND CARBON CORPORATION

Post Office Box P
Oak Ridge, Tennessee

Equipment needed immediately:

PUMPS—1 only ½" for handling 1.84 Sp. Gr. Sulphuric Acid.
—(Centrifugal) 3 only 1½" Acid proof
2 only 2" Acid proof
2 only 2½" Acid proof
1 only 3" Acid proof

Turbo type AGITATORS, Acid Proof, with or without tanks
2 only for 6' x 6' tanks
3 only for 8' x 9' tanks
4 only for 10' x 10' tanks

FANS—3 only 10" to 15" or larger (Acid proof)
MOTORS—13 only 60 Cycle 550 Volts 3 phase motors 5 to 10 H.P.
LIGHTENING MIXERS—2 only ½ H.P. Shaft and propellers S.S.
SUBMERGED HEATERS—4 only Acid proof
MOTOR—GENERATOR SET—1 only 2000 amp 15 volt
TANKS—1 only 1,000 gal. steel
1 only 12,000 gal. steel or
2 only 6,000 gal. steel
MIXER—1 only Patterson Type G.P.M. Mixer approximately 24" x 20" x 120"
THICKENERS—2 only 20 foot 3 compartment or
6 only 20 foot single thickeners.
2 only 17 foot 3 compartment or
6 only 17 foot single thickeners.
submerged mechanism in thickeners to be Acid proof.
FILTER PRESS—2 only, Acid Proof, 60-90 Plate & Frame, Automatic Discharge
FEEDERS—3 only Small Non-Vibrating

DELORO SMELTING & REFINING CO. Limited Deloro, Ontario

FOR SALE
PLANT SITE

Formerly occupied by E. I. Du Pont de Nemours, Grasselli Chemical Division, Sulphuric Acid Unit, Niles, Ohio, 150 acre tract along main highways and B & O Railroad. Ten acres enclosed with cyclone fence. City power, water, and also raw water with complete pump house and 8" lines available. Several small buildings including office. Over 3000 feet railroad siding—part double track.

Equipment Also Available

Two Acid Storage Tanks 31' dia., 24' high. Ammonia Storage Tanks 10'6" x 46' and 8' x 36'. Forty foot Sulphur Elevator and Hopper. Two Oxidizer Stripping Columns with heat exchanger cones. Grinnell Automatic Dry Valve Sprinkler System. Miscellaneous recording instruments, Structural Steel, Pipe, and Fittings.

TRUMBULL INDUSTRIAL SERVICE, INC.
NILES, OHIO Telephone 2-2808

CHEMICAL PLANT
WANTED

We are now manufacturing over $20,000,000 in various lines and wish to expand by acquisition of assets or stock of one or more industrial companies. In our negotiations the sellers' problems and wishes will receive full consideration. Present personnel will normally be retained.

Address all replies

"Confidential" C. J. GALE, Sec.
230 Broadway, N. Y. 7, N. Y. BA 7-1515

COMPLETE PLANTS OR SURPLUS SECTIONS OF ENLARGED PLANTS
Wanted for Liquidation

Preferably in the following Industries:

Petroleum Refining	Gasoline Plants
Chemical	Petrochemical
Recycling Plants	Tank Farms
Pipe Lines	Utility Plants

Compressor Stations

OR SINGLE PIECES OF REFINERY EQUIPMENT

WRITE - - - PHONE - - - WIRE
Howard Kinslow

KINSLOW POWER & EQUIPMENT, INC.
817 So. Boulder Strode Building
Phone 5-5914
Tulsa 14, Oklahoma

BUY - BARTER - SELL

Phenol — Phthalic — Maleic
Glycols—Titaniums—Zinc Oxides
—Hydrosulfite Bichromates—Ethanolamines — Pine Oil — Benzol — Dyes — Colors, etc.
Salicylic Acid — Aspirin
Sulfa Drugs.

CHEMICAL SERVICE CORP.
80-04 Beaver St. New York 5, N. Y.

AVAILABLE CUSTOM REFINING FACILITIES
• Distillation • Extractions
• Separations • Fractionations
Drum Lots—Tank Cars

WANTED
• All Types of Crude Mixtures
• By-Products, Residues, Wastes
• Contaminated Solvents

TRULAND CHEMICAL & ENGINEERING CO., INC.
Box 426, Union, N. J. UNionville 2-7360

WANTED:
50 Gal. Jacketed
BAKER PERKINS MIXER
In good condition
Type V or VI—Class BB—Sigma Blades
W-2178, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

Compressors Wanted
STATIONARY - PORTABLE
LARGE OR SMALL
L. W. BAUER
265 Essex Avenue Bloomfield, N. J.

WANTED
VACUUM PUMP
50 Cu. Ft. Per Minute Capacity
ARTHUR A. HOLLAND
1705 North 12th Ave. Pensacola, Fla.
Phone 2449

IF THERE IS
Anything you want
that other readers of this paper can supply
OR—
Something you don't want
that other readers can use, advertise it in the
SEARCHLIGHT SECTION

WANTED
Model H 7 or Model L 6
NASH VACUUM PUMP
LUBRIZOL CORP.
Box 3057 Cleveland 17, O.
RE. 1-2200

WANTED METAL-SCRAP
Buyers of
• Copper Scale • Copper Oxides
• Copper Catalyst • Copper Powders
OPELL METAL ASSOCIATES
4 E. 41 Street New York 17, N. Y.
MUrray Hill 3-3421-2-3

STOP!

SELL US YOUR IDLE MACHINERY

GET CASH FOR IT—QUICK

AND BUY NEEDED MACHINES FROM

"CONSOLIDATED"

IMMEDIATE DELIVERY — BIG SAVINGS

FILTERS & FILTER PRESSES

1—Sperry, iron, steam heated, 30" x 30", 30 chambers.
6—Shriver & Johnson 30 x 30 iron plate and frame, 35-40 chambers each.
1—36" Sperry C. I. FILTER PRESS, recessed, open delivery, 60 chambers, 1½" ea., pump, explosion-proof motor.
1—8' x 12' ALL STAINLESS STEEL Feinc Rotary Continuous Vacuum Filter, string discharge with blankets and STAINLESS STEEL trough, repulper, receivers, vacuum pump, motors, reducers, etc. ETAO #387.
1—8' x 12' Oliver Lead-Wood Vacuum Filter, Acid-Resisting.
3—Oliver Vacuum Filters, incl. 8' x 12', 11'6 x 14', 11'6 x 18'.
2—ALUMINUM Sperry FILTER PRESSES: 1—30" x 30" 45 chambers, 1—24" x 24" Plate and Frame, 24 chambers.
1—#12 Sweetland Filter, 36 leaves on 4" centers.
1—Kilby 39 x 39 CI Filter Press, open delivery.
1—#5 Sweetland, Stainless Steel Lined with 30 stainless steel leaves, on 2" centers.

DRYERS

1—4' x 30" STAINLESS STEEL-LINED Louisville Rotary dryer with reducer and 10 H.P. motor.
2—5'6" x 24' Direct Heat Rotary Dryers or Rotary Kilns, welded shell.
1—Devine #7 Vacuum Shelf Dryer, 13 shelves 40 x 43.
2—Buflovak Double Drum Dryers 32" x 90" complete.
1—Devine Rotary Vacuum Dryer, 2' x 8'.
2—Buflovak Vacuum Drum Dryers, 5' x 10' with all accessories.
1—6' x 50' Louisville welded shell Rotary Steam Tube Dryer with two rows, 54 tubes. Also two 6' x 27' Davenport, same type.

MIXERS

4—Baker Perkins, jack. Mixers, 3,000 gal., size 30, type X.
1—100 gal. jack. W. & P. Mixer, heated blades.
10—Baker Perkins, jacketed, heavy duty, 10 gal. to 500 gals.
1—50 gal. jacketed W. & P. Mixer, M.D.

JACKETED KETTLES

65—Aluminum & Stainless Steel, 20 gal. to 150 gal.
1—500 gal., open.
2—750 gal.
1—5,000 gal., steel, closed agit.

STAINLESS STEEL CENTRIFUGALS

2—42" All Stainless Steel Centrifugals, Amer. T&M Co., each with S/S basket, curb, casing, shaft, unloader, and 40 H.P. variable speed Slip Ring 3/60/440 V. 1200 RPM motor with full controls. Suspended bottom discharge type. Now at Newark.

CONTINUOUS CENTRIFUGALS

1—36" x 40" Bird-Laughlin Continuous Centrifugal horizontal slotted bowl with stainless steel internal screens. With 25 HP motor.

MISCELLANEOUS

2—STAINLESS STEEL, 347 Distillation Columns, 31½ dia. x 17' high—15 bubble cap plates, 24 caps per bubble.
1—Copper Rectifying Column, 6 6 sections, 30" dia. x 33' high bubble cap type.
6—Ross 20 gal. heavy duty Pony Mixers.
1—Abbe 175 gal. Buhrstone-Lined Pebble Mill.
15—Dry Powder Mixers and Blenders, rotary and horizontal ribbon type, 100 to 5000 lb.
1—Pneumatic Scale Automatic Packaging Unit, incl. Tight Wrap, 32 per minute.
4—All STAINLESS STEEL No. 71 Day "ROBALL" Sifters, 40" x 84".
4—Swenson-Walker, jacketed, Crystallizers.
1—5' x 16" Hardinge Ball Mill, iron lined.
1—6" x 15" Sturtevant Jaw Crusher —to ½".
1—30" x 16" Set Sturtevant Crushing Rolls, balanced type.
1—5-Roll Raymond High Side Pulverizer.

ONLY A PARTIAL LISTING—SEND US YOUR INQUIRIES

CONSOLIDATED PRODUCTS COMPANY, INC.
15 PARK ROW, NEW YORK 38, N. Y. BArclay 7-0600

FOR EQUIPMENT

PHONE HANOVER 2-4890

AGITATORS
Patterson 5 HP 82 RPM Type M40.
Patterson 7½ HP 82 RPM Type M40.
Patterson 3 HP 15 RPM vert.

AUTOCLAVES
2,000 gal., steel, jack'td., 200 PSI (6).
75 gal. steel jack'td., 300 PSI int. 75 PSI jacket.

BLENDERS
Copper, conical, 2.7 cu. ft. (3).

CENTRIFUGES
Bird 40"x60" solid bowl, rubber lined, cont.
Bird 24" continuous Type CH.

CLASSIFIERS
Flight Classifier 14'9" cc. 23 blades on 2 chains.
Duplex Dorr, Type DSFH, 19'8"x5'x7'.

COLUMNS
6'x44'x2¼" shell 5" heads 225 PSI.
6'x43'x⅜" shell 9/16" heads 19 bubble cap trays.
6'x29'8" STAINLESS STEEL Type 347, 50 PSI, 21 bubble cap trays, 40 caps per tray.

CONVEYORS
Apron 36"x34' cc.
Belt Troughing 10"x104' cc.
Belt Troughing 18"x475' cc. (2).
Belt Troughing 30"x96' cc.
Belt Troughing 42"x30' cc.
(Write for Complete List of Conveyors)

CRUSHERS
Two-Roll Traylor, 40"x14".
Traylor, Bulldog, Jaw, 18"x36".
Bartlett & Snow, spiked, 14"x16".

DRYERS
Tubulaire H2 with filter.
Stokes 59AB with condenser, dust collector & motor.
Spray 3'x6' Laboratory, sta. steel, electrically heated.
Vacuum Shelf #11 Devine, 170 sq. ft. surface.
Vacuum Buflovak 24"x20" 55 drum cast aluminum casing.
(FOR ROTARY DRYERS, SEE KILNS)

ELEVATORS—BUCKET
78' cc. 12"x7" buckets steel cased.
70' cc. 8"x5" buckets steel cased.
60' cc. 8"x6" buckets steel cased.
40' cc. 6"x4" buckets steel cased.
34' cc. 10"x6" buckets steel cased.
23' cc. 8"x5" buckets steel cased.

FILTERS
30" Sperry, Type 47, 26 frames, hydraulic closure.
8'x12' Feinc, all steel.
8'x10' Oliver, wood & steel (3).
11'6"x18' Oliver, all steel.
#7 Sweetland, 2" spacing, 19 leaves.

KETTLES
40 gal. SS Clad 40 PSI jack't. (6).

KILNS
8'x125'x1¼" Bethlehem Fdry.
8'x100'x1¼" Bethlehem Fdry.
8'x80'x1¼" Bethlehem Fdry.
7'x60'x1½" with lifters.
6'x60'x1¼" with lifters.
6'x14'x9/16" Struthers-Wells (2—NEW).
5'x67'x⅝" with lifters.
4'x34'x5/16" Struthers-Wells.
4'x25'x5/16" brick-lined.
4'x16'x⅜" Iowa with burner & stack.
3'x25'x⅛" brick lined.

KOMBINATOR
Flow Master K Model 200, 7½ HP drive.

MAGNETIC BELTS
20"x7'3" cc. with magnet box (3).
20"x36", 110 volt (NEW).

MILLS
6'x8' Patterson, Pebble.
6'x8' Abbe Style GPH, Pebble.
16"x40" Day, 3-roll, Ink.
22"x12" Abbe, 4-cage.
Abbe Size B Grinding.
36" Stedman 4-row cage.
#3 Williams Hammer Mill.

MIXERS
Bicks Type TM-60, 100 gal. (2).
Blystone 500 gal. cap. heavy duty (2).
Champion 110 gal. Type E, Size 2.
Super Ajax #3, 173 gal.
Double Shaft Paddle, 1,050 gal. (NEW).
Readco 1½SA 88 gals.

PRESSES—TABLET
Colton, Type 200 RP (3).
Colton, Type 2RP (2).
Colton, Type 3DT (9).

PROPANE PLANT
Complete plant vaporizing & mixing equipment including 18,000 gal. storage capacity in 3—6,000 gal. tanks, ASME U69, 200 PSI working pressure.

PULVERIZERS
Allis Chalmers Size 1 with automatic feeder.
Jeffrey 30"x24" Type A2.
Jeffrey 36"x24" Type A2.

TANKS
15,300 gal. 9'x32'x3/16".
13,500 gal. 10'x21'6"x1".
10,500 gal. 9'x23'x⅞" 150 PSI.
8,200 gal. 6'x40'x2" 300 PSI.
3,500 gal. 5'x23'x½" 200 PSI.
1,100 gal. 5'x7'8"x⅜".
480 gal. 4'x5' wood (NEW).

TANKS—STAINLESS STEEL
3,000 gal. 5'x21'6"x¼" Type A30.
2,300 gal. 5'x16"x¼" Type 304.

TANK CAR TANKS
6,500 gal. 76"x26'7", shell 11/16" & 5/16", dome top, ladder inside (30 avail.).

→ ABOVE IS ONLY PARTIAL LISTING OF OUR INVENTORY ←
ASK FOR BROCHURE

Heat and Power Co., Inc.
70 PINE STREET — HANOVER 2-4890 — NEW YORK 5, N. Y.
MACHINERY & EQUIPMENT MERCHANTS

STORAGE TANKS

—Prompt Shipment—

GLASS LINED TANKS — USED — 3000 gallon capacity. Welded construction—Fully insulated. Equipped with manhead. Suitable for milk, food products, lily white chemicals, solvents and fine lacquers.

TWO COMPARTMENT TANKS—USED—Hinged covers. 60" x 10' x 33" deep—3/16" Steel. 750 gallons. Suitable for cooking-mixing or storage.

VARNISH TANKS—USED—54" diameter x 14'6" high (or long) ¼" Steel — Welded construction—1700 gallons.

MISCELLANEOUS TANKS—Various sizes and types.

ERMAN-HOWELL DIVISION
LURIA STEEL & TRADING CORP.
332 South Michigan Ave.
Chicago 4, Ill.
Telephone: Wabash 2-0250

FOR SALE
500 gal. S.S. Mix. Tank, water jkt. 60"x44".
3000 gal. Horizontal S.S. Tank. 5'7"x17'7".
3000 gal. S.S. Truck Tanks & Trailers.
6 ft. Dia. S.S. Vacuum Pan.
S.S. Heat Exchangers, Plate & Surface Type.
100 gal. S.S. Clad Jkt. Kettles, 30"x32".
500 gal. S.S. Mix Tank, 71"x36".
300 gal. Copper Tank, 42"x36".
300 gal. Pfaudler Horiz. Glass Lined Tank, 25#.
Day Vibrating Screen, 40"x104", 1 H.P.
28"x10" to 42"x120" Double Drum Dryers.
4—50 gal. Steel Kettles, 75# jkt., A.S.M.E.
Premier Colloid Mill 6", 7½ H.P. motor.
Model 1SH Mikro Pulverizer, 5 H.P.
75 to 1500 gal Homogenizers or Viscolizers.
60" Centrifugal Extractors, s.s. baskets & carbs.
Model 140C Stokes High Vacuum Pump, 1½ H.P.
12x8 Chicago Pneumatic Vacuum Pump, 5 H.P.
Send us your inquiries
LESTER KEHOE MACHINERY CORP.
1 East 42nd Street, New York 17, N. Y.
Murray Hill 2-4616

STEEL STORAGE TANKS

8—20,000 GAL. 19'6" x 31' Horiz.
6—10,000 GAL. 10' x 17'2" Horiz.
4—15,000 GAL. 10'6" x 23'6" Horiz.
19—42,000, 126,000, 210,000 and 420,000 GAL. CAP. VERTICAL.

L. M. STANHOPE, Rosemont, Pa.

TWO-TUBE MILLS

Allis Chalmers 5'—0" x 22'—0"; Silex lined; Link Belt reduction gear units; 100 HP slip ring motors with grids & drum type controllers.

TOLHURST CENTRIFUGALS

One battery of Two, 40", bronze baskets, bottom discharge, suspended type, 5 HP, 720 RPM vertical motors direct connected. Hand operated unloaders. Mounted in steel framework.

AGITATORS

Two with 8'—0" dia. x 7'—0" vert. tanks
One with 8'—6" dia x 6'—0" vert. tanks
steel superstructure, vertical shaft with multi bladed propeller, 5 HP vert. motors with reduction units. Output shaft speed 54 RPM.

WORTH MACHINERY CO.
8712 S. San Pedro St.
Los Angeles 3, Calif.
PHONE: PLeasant 30276

SAY "NEIGH! NEIGH!" TO DELIVERY DELAY

GET GELB MACHINERY

WHY HORSE AROUND WASTING TIME AND MONEY?

THE GELB GIRL OCTOBER 1951

- 2—Swenson-Walker Stainless Steel Jacketed Crystallizers, constructed of 316 Stainless Steel, each Crystallizer equipped with 4-10' sections.
- 8—Dowington Stainless Steel Heat Exchangers, 500 sq. ft. each.
- 1—Nickel Jacketed Vacuum Kettle, 65 gal. cap.
- 2—Stainless Steel Open Top Jacketed Kettles with Stainless Steel Jacket, 20 and 50 gal. cap.
- 2—Stainless Steel Packed Columns 30" x 32'.
- 1—Stainless Steel Hydrogenator, 360. cap. 250 lbs. PSI.
- 1—Niagara Stainless Steel Filter, 146 sq. ft.
- 2—Sperry Rubbed Covered Plate & Frame Filter Presses, 24" x 24" Open Delivery, 14 Chambers.
- 2—Stainless Steel Jacketed Vacuum Kettles, 250 gal. cap.
- 1—Nickel Jacketed Kettle, 400 gal. cap.
- 1—Nickel Jacketed Vacuum, 10 gal. cap.

2—Mikro Atomizers, Stainless Steel construction, #5 & #6.
1—Pfaudler Glass-Lined Evaporating Dish, 12 gal. cap.
1—Sperry Bronze Plate & Frame Filter Press, 18" x 18", 21 chambers.
4—Rubber-lined Storage Tanks, 1,000 gals. cap. each.
1—Tolhurst Stainless Steel Suspended type Centrifuge, 40" Imperforated Basket.
10—Sharples Super Pressurite Centrifuges #6.
1—Sharples Super Pressurite Centrifuge, Stainless Steel Bowl, Model #16Y.
1—Jacketed Vacuum Autoclave, 600 gal. cap. with Agitator.
1—Blaw-Knox Jacketed Autoclave 3' x 4'2" with Agitator.
1—High Pressure Steel Autoclave, 900 psi., 3' x 4' with Agitator and Motor Reducer.
2—Blaw-Knox Jacketed Autoclaves with Agitators, 300 and 500 gal. cap.
1—Gemco Copper Conical Blender, 3½ cu. ft.
1—Kewanee 125 H.P. Boiler, 125 lbs. pressure.
2—Black & Clawson Double Drum Dryers, 28" x 5'.
1—Louisville Rotary Steam Tube Dryers, 6' x 50'.
2—Buflovak Vacuum Drum Dryers, 24" x 20".
2—Buflovak Vacuum Drum Dryers, 5'10" x 10".
3—Louisville Rotary Steam Tube Dryers, 6' x 25'.
1—Buflovak Double Drum Dryer, 32" x 80".
1—Fitzpatrick Stainless Steel & Bronze Model Comminuting Machine.
1—Buflovak Double Drum Dryer, 24" x 36".
3—Buflovak Flakers 5' x 12'.
1—Royal #21 Perforated Extruder, with heating unit.
4—Steel Heat Exchangers, 800 sq. ft. each.
4—Sperry 36" x 36" Recessed Type Filter, centre-feed, open-delivery, 42 Heresite covered Plates.
1—Sperry Aluminum Filter Press, 18" x 18", 9 Chambers.
1—Sperry 42" x 42" Wooden Plate & Frame Filter Press, Closed Delivery, 54 Chambers with hydraulic closing device.
1—Shriver Cast Iron Jacketed Plate & Frame Filter Press, 38" x 48", 40 Chambers.
1—Sperry Aluminum Filter Press, 24" x 24", 22 Chambers.

- 1—Stainless Steel Jacketed Vacuum Kettle with agitator, 250 gal. cap.
- 1—Stainless Steel High Pressure Kettle, 360 gal. cap.
- 2—Patterson Jacketed Vacuum Autoclaves, 4' x 10' with Drives and Motors.
- 1—Stainless Steel Jacketed Reactor, 550 gal. cap. with Stainless Steel Condenser & Stainless Steel Packed Column.

1—Artesian Metal Works Steel Jacketed Kettle, 1000 gal. cap. with agitator.
1—Ross 50 gal. cap. Change Can Mixer.
12—Stainless Steel Storage Tanks 500 gal. cap. Unused.
2—Shriver Cast Iron Filter Press, 36" x 36", Closed Delivery, 25 & 36 Chambers.
1—Sperry Cast Iron 30" x 30" Filter Press, Recessed Type, 55 Chambers, Open Delivery.
8—Cast Iron Jacketed Kettles, 210 to 600 gal.
1—J. P. Devine Vacuum, Jacketed Kettle, 3000 gal. cap.
9—Steel Electrically Heated Kettles, 450, 900 & 1000 gal. cap.
1—Sanbury Mixer #21 with 50 Hp motor.
3—Baker Perkins Double Arm Mixers, 200 gal. cap., sigma blades.
2—J. H. Day Mogul Type Mixers, 2½ & 5 gal. cap.
5—Simpson #10 Intensive Mixers, "Unused".
1—Patterson Porcelain Lined Pebble Mill, Type D, with 25 HP motor.
3—Hardinge Conical Ball Mills, 8' x 30", 5' x 22" and 6' x 22".
1—Abbe Engineering Silex-Lined Pebble Mill, 6' x 12'.
2—Mikro Pulverizers #1 SH.
1—Mikro Stainless Steel Pulverizer #2 TH.
3—Steel Storage Tanks, 10,000 gal. cap.
2—Copper Columns, 36" x 80'.
1—J. H. Day #71 Ro-Ball Jacketed Stainless Steel Gyrating Screen Cooler.

Established 1876

R. GELB & SONS, Inc.,

CHEMICAL, RUBBER, OIL, PLASTIC and FOOD PROCESSING MACHINERY

STATE HIGHWAY No. 29, UNION, N. J. · UNionville 2-4900

FOR SALE

1 Illinois Water Treating System, 500 GPH flow rate, complete with Zeolite tank, controls, etc.
1 Hardinge Conical Ball Mill, Steel Liner, 4'6" dia. x 24" long, complete.
3 Sprout Waldron Attrition Mills, double disc—sizes 16 and 36.
1 Williams Hammer Mill, type AX; size A, stainless steel.
2 Mikro Pulverizers—#281, #17.

4 INDUSTRIAL FILTER & PUMP MFG. CO. Pressure leaf filters, type RB-2, size 18 x 48, approx. 68 sq. ft.; rubber lined tank, bronze baffles. With slurry tank, pump & motor.

2 Sweetland Filters—#2 and #5.
1 Swenson Rotary Continuous Vacuum Filter: Precoat type, 8' dia. x 8' face, rubber covered and lead acid proof construction.
10 Filter Presses, 12" to 36", C. I., P&F.
2 Louisville 8-roll Continuous Grains Presses, 24" and 26".
1 Vacuum Pan Dryer or crystallizing Kettle, 10' dia. x 3' deep.
2 Pan Dryers or crystallizing Kettles, 18' dia. x 3' deep and 5' dia. x 30" deep.
1 Stokes #59A Vacuum Rotary Dryer, 18" dia. x 42" long, with pump and condenser.
2 Atm. Double Drum Dryers, 22" x 38".
1 Atm. Tray Dryer, 1080 sq. ft.
1 Cummer Rotary Indirect Hot Air Dryer, 4' dia. x 30' long, complete.

LIQUIDATING FORMER SCOTTISH AMERICAN DISTILLERY
Foot of Alexander St., Peoria, Ill.

Distillation and processing equipment; Grain equipment and storage bins; Screw conveyor and bucket elevators; Copper tubular condensers; double pipe beer cooler; bronze pumps; copper tanks, steel tanks, etc. Write for List or contact Mr. ZAROW at Peoria 2-4524

1 Porter heavy duty jacketed double worm mixer—75 gal.
2 Read heavy duty double arm jacketed mixers, 200 gal. working cap.—1 stainless lined.
1 Read jacketed Ribbon Mixers, 80 gal.
1 Broughton Powder Mixer, double arm, 3400#.
4 Selectro Vibrating Screens, stainless steel, 2' x 7', double deck, enclosed.
2 Kux Mach. Co. Model 25 Rotary Pellet Presses, 21 & 25 punch—with motor and vari-drive.
6 Stokes Rotary Pellet Presses, 18 punch —B-2, D-3, D-4.
1 Byron Jackson Deep Well Pump, 150 GPM—335' head, NEW.
1 Ingersoll Rand Bronze Centrifugal Pump #5ALV, 40 HP motor, 850 GPM at 140'—NEW.
2 Ingersoll Rand Bronze Centrifugal Pumps, #1½-RVH, 20 HP motor, 300 GPM at 230'.

STAINLESS STEEL KETTLES
20# Jacket—Vertical Agitators
3—2700 gal. cap. 7'6" dia. x 7'6" high.
2— 950 gal. cap. 63" dia. x 78" high.
Type 347 stainless steel shell; cast iron top.

70 Stainless Steel and Stainless Clad open top, steam jacketed kettles—10, 20, 40, 60, 80, 100, 150, 200, 250, 500 gal. sizes.
2 Stainless Steel, type 316, closed tanks—300 gal.
30 Stainless Steel, type 304, tanks—6, 15, 30, 50, 80, 100, 150, 300, 1000, 1480, 3500, 5700 gal. sizes.
1 Stainless Steel, type 347 Autoclave or pressure tank; 250# pr. Elec. heated 850° F; 100 gal. cap., 17¼" dia. x 9' high.
3 Aluminum Tanks, 1100 to 1485 gal.
2 Monel Tanks, 69 gal. bolted top, coils.
6 welded steel tanks, horiz., 5100 gal. & 11,000 gal.
1 Dopp Cast Iron 300 gal. kettle, jacketed & agitated, open top.
1 Glass Lined Kettle, Jktd. & Agit. 50 gal.
1 Steel Autoclave, 120 gal., 23" dia. x 74" deep, 125# int. pr. 15# jkt. pr.
1 Steel Autoclave, 50 gal., 23" dia. x 36" deep, 300# int. pr. 100# jkt. pr., agitated.

1 FEINC Rotary Vacuum Filter, string discharge, 4'6" dia x 6' face, aluminum

2 Suspended 48" dia. Basket centrifugals, Bird & Troy.
2 DeLaval #600 Oil Purifiers.
3 Copper Vacuum Kettles, 48" dia., jacketed, agitated.
1 Copper Vacuum Evaporating Pan, 8' dia.—jacketed and coils.
1 Struthers Wells Evaporator, 100 sq. ft.
2 Worthington 6½ x 6 Vacuum Pumps.
2 Spencer Turbine Co. Gas Boosters or Compressors, stainless steel, 30 HP motor, 600 CFM at 80 oz. pr.
2 Ingersoll Rand Type PS-530 Blowers, 4000 CFM at 3 lb. pr.
3 Ammonia Compressors—9 x 9, 7½ x 7½, 6 x 9.
3 Shell & Tube Condensers: 30 & 200 sq. ft. Stainless Steel: 487 sq. ft. copper.
2 Copper Beer Still Columns with condensers, etc., 24" dia., 30" dia.
6 Copper Bubble Cap Columns, 18" dia. to 48" dia.
6 Aluminum Columns, Bubble cap, etc.—24", 27" & 36" dia.
1 Steel Bubble Cap Column, 62 plates, 28" dia.
2 Copper Extraction Stills—45 GPH & 70 GPH.
2 Water Stills, 50 GPH & 250 GPH.

5—Vertical Jacketed Pressure Tanks—steel — 30# steam jacket — 6mm vacuum internally:
3—34" ID x 15' H (approx. 700 gal.)
1—23" ID x 10' H (approx. 230 gal.)
1—23" ID x 9' H (approx. 195 gal.)

BOTTLING CANNING PROCESSING — PERRY MACHINERY SUPPLIES

PERRY EQUIPMENT CORP.

1413 N. 6th St. STEVENSON 4-7210 PHILA. 22, PA.

THIS SPACE IS LIMITED TO A LISTING OF A SMALL PERCENTAGE OF OUR STOCK. WE HAVE OVER 300 ADDITIONAL LISTINGS. SEND US YOUR INQUIRIES.

6—Stainless Steel Jack. Tanks 850 & 2,700 gals. with Agitators.
1—Struthers-Wells 250 gal. Steel Reactor—Code Const.
4—Alum. 27" & 36" Bubble Cap Columns.
7—Cast Iron Filter Presses 12" to 42".
1—Stokes "B" Single Punch Tablet Machine.
1—Horiz. 3/16" S.S. Tank 2,500 gals.
1—Bullovak Vac. Crystallizer 6' dia.
1—Swenson Stainless Clad Continuous Evap. 340 sq. ft.
2—Mikro Bantam and S.S. 2FF Pulverizers.
2—Day 3-Roller Mills 5" x 12" & 12" x 32".
1—Lancaster 48" Model EAG-3 Mixer.

We Buy Complete Plants or Individual Items.

THE MACHINERY & EQUIPMENT CORP.
533 West Broadway
New York 12, N. Y. *GRamercy 5-6680*

GOOD BUYS
FOR IMMEDIATE DELIVERY

Complete Laboratory. Inventory Available
7 Abbe Belgian Block Lined Mills, 5' x 6', 4½' x 5', 30" x 36"
2 Mikro Pulverizers, Bantam, #18H, & #2TH
1 H. Day Jktd. Vacuum Mixer, 5 gal. Working. S. S. Sigma Blades & S. S. Bowl. Like New
Type 347 S. S. Tumbling Barrel, 5' x 5'
9 Shriver & Sperry Filter Presses, 6" to 42"
Day 15 gal. Jktd. Mixer, 2 cored Masticator Arms, with reducer & 5 HP motor
Groen 200 Gal. S. S. Jktd. Tilt Kettle
Hardinge 7' x 49" Belgian Block Lined Mill, with Falk reducer & 50 HP AC motor
Oliver 8' x 12' Continuous Filter, complete
Bird 40" Suspended Type Centrifugal, rubber covered, plow & bottom dump, with motor
S. S. Fitz Mill, Model D, with 5 HP AC motor
420 Gal. Steel Reactor, 48" x 48", Jktd. & Agtd., with explosion proof motor
Bird 40" x 40" Solid Bowl Centrifugal Filter, rubber covered. Like New.

WHAT HAVE YOU FOR SALE?

For BETTER BUYS & Service
Phone SOuth 8-4451—9264—8782

You can BANK on

EQUIPMENT CLEARING HOUSE, INC.
289-10th ST. BKLYN 15 N. Y.

"SEARCHLIGHT"
IS
Opportunity Advertising

—to help you get what you want.
—to help you sell what you no longer need.

Take Advantage Of It

For Every Business Want

"THINK SEARCHLIGHT FIRST"

Another BRILL *Liquidation*

SYNTHETIC RESIN PLANT - LOCKPORT, N. Y.

1—BOWEN 16' diameter SPRAY DRYER with two high speed spray machines, Bowen atomisers, fans, Sirocco dust collectors, controls, etc.
1—ROGERS 16' diameter SPRAY DRYER complete with fans, Dracco dust collectors, heating and pumping system, controls, etc.
1—450 gal. stainless steel lined jacketed, agitated KETTLE, m.d.
1—350 gal. stainless steel lined jacketed, agitated KETTLE, m.d.
2—10' x 14'7", (8000 gal. each) stainless steel lined VERTICAL TANKS.
1—50 ton WORTHINGTON 7" x 7" Type VSA new 1948 two cylinder AMMONIA COMPRESSOR with gauges, controls, V-belted to 50HP motor and with EV-126-A York evaporator condenser and receiver, etc.
1—1 ton YORK AMMONIA COMPRESSOR with tank and expansion coil.
1—15' x 25' x 9' deep with 3' cone bottom chute collapsible STEEL BIN on structural steel supports.
10—Steel TANKS 100 to 1000 gal., some agitated.
1—Atlas Type "U", 24' long portable BULK LOADER with rubber belt, motor driven.
1—40" x 7' rubber lined TANK.
1—Syntron Barrel Shaker, Type V200.
5—PORTER ¼HP, Type V-153 Agitators.
3—"U" Type and flat rubber Belt Conveyors.
2—KEELER 125HP, ASME CODE water tube boilers with McClave Stokers.

Pumps, Blowers, Fans, Transformers, Motors, Starters, Recorders, Office and Lab. furniture.

PROPERTY consists of 20,000 sq.ft. of building with all utilities and sprinkler system, and over an acre of land. Excellent opportunity to utilize Spray Dryers on location.

Partial List Only—Write For Detailed Circular

STOCK ITEMS

2—Bird 36" x 50" solid bowl Continuous Centrifugals rubber covered.
2—Bird 40" Suspended Type Centrifugals S.S. perforated basket, bottom discharge.
2—Oliver 8' x 10' monel Rotary Vacuum Filters, complete.
1—Vallez #49 Pressure Filter, 41 leaves.
1—Sweetland Filter #2, with 17 steel leaves.
5—Oliver Rotary Vacuum Filters 11'6" x 14', 8' x 12', 8' x 8'.
3—Feinc Rotary Vacuum Filters 8' x 12', 4' x 5', 3' x 2'.
2—Elmco 3' x 1' Type 316 S.S. Rotary Vacuum Filters.
2—Shriver 24" x 24" P&F Filter Presses, 20 chambers, washing.
2—Sperry aluminum Filter Presses 30" x 30", 24" x 24".
6—Shriver, Sperry and Independent 42" x 42" C.I. Skeletons with hydraulic closures.
1—Raymond 3-Roll High Side Mill, double whizzer.
7—Abbe 6' x 8', 5' x 5', 4'6" x 3'6", 3'9" x 3'6", 2'6" x 3' Pebble Mills.
6—Patterson 6' x 10', 4' x 5', 3'6" x 4', 3' x 4' Pebble Mills.
3—Mikro Pulverisers #2DH, #1SH and Bantam.
2—Jeffrey 24" x 18", 20" x 12" Hammer Mills.
2—Hardinge Conical Ball Mills 16' x 36", 6' x 22'.
3—Raymond 8', 6' and 4' Air Separators.
1—Ball & Jewell #1½ Rotary Cutter.
2—Rotex Double Deck Sifters 40" x 84", 20" x 48".
4—Sprout Waldron Single Deck Sifters, S.S., 40" x 84".
6—Tyler Hummer Screens, 4' x 10', 4' x 7', 3' x 5' Single and Triple Deck.
6—2000 gal. steel, jacketed, agitated Kettles, 200 psi.
1—1000 gal. steel, jacketed, agitated Kettle, 50#.
1—Baker Perkins 30-gal. Unidor Mixer Size 16, S.S.
1—Baker Perkins 100-gal. Type JNM Double Jacketed Mixer, Sigma blades.
2—Buflovak 32" x 100" Atmospheric Double Drum Dryers complete with drives, motors and accessories.
1—Single drum Dryer or Flaker, S.S. 5' x 6'.
1—Single Drum Dryer or Flaker, 60" x 80".
1—Link Belt 2'7" x 8' Roto-Louvre Dryer, monel.
1—Link Belt 11'6" x 35' Roto-Louvre Dryer, steel.
4—Rotary Dryers 8' x 80', 7' x 60', 6' x 60', 5' x 67'.
2—Bethlehem 8' x 125' Kilns, ⅜" shell.
4—Stokes and Buffalo Rotary Vacuum Dryers 18" x 42", 30" x 8', 3' x 15', 5' x 30'.
1—P&S Conveyor Dryer 8' wide x 48' long, stainless belt.
10—Bucket Elevators 36' to 90' centers, steel housings, 8" x 12" malleable iron buckets, motor driven.
3—Horizontal Autoclaves 6'6" x 65' with quick-opening door.
7—Stokes, Mikrovac Vacuum Pumps 10 to 100 CFM.
5—Devine, Buffalo Combination Condensers & Receivers, 30 to 96 sq. ft.
5—Stokes Rotary Tablet Machines DD2, D4, D3.
1—Colton Single Punch Tablet Machine #5½.

WE SPECIALIZE IN DISMANTLING & LIQUIDATING COMPLETE PLANTS

BRILL EQUIPMENT COMPANY 2401 Third Ave., New York 51, N. Y.
Tel: Cypress 2-5703

REBUILT & GUARANTEED MACHINERY

IMMEDIATE DELIVERIES – AT GREAT SAVINGS

UNION Rebuilt Machinery Established 1912

International S.S. Straightline Vacuum Filler, 160 per minute.

Resina S and LC Automatic Cappers.

New Way MH Wraparound Labeler.

S. & S. G1, G2, HG88 Auger Fillers.

Colton 2 & 3RP Rotary Tablet Machines.

Stokes 90D Auto. Tube Filler & Closer.

Stokes 2C Cream Filler and Closer.

Triangle Package Elec-Tri-Pak, G2C, G2S, A2C, N2CA and A6CA Fillers.

Triangle SHA Filler and Carton Sealer.

Filler 1, 2, 4 and 8 Head S. S. Fillers.

Horiz. S. S. 14 head Rotary Filler.

Standard Knapp No. 429 Carton Sealer.

Mikro 4TH, 2TH, 1SH Pulverizers; Jay Bee U1, Schutz-O'Neill.

3500 gal. working cap. Steam-Jacketed, Double-Arm, Mixing Tanks for mixing, storing or processing of your materials.

Baker Perkins 200 gal. Unidor S. J. Double Arm Mixer.

F. J. Stokes, J. H. Day, New Era, Hottman Mixers, from 2 gallons up to 450 gallons, with and without Jackets, Single and Double Arm Agitators.

Baker Perkins and Readco Heavy Duty 5-150 gallon Double Arm Jacketed Mixers with Sigma or Fish Tail Blades.

Ross, Day Pony Mixers, 8, 15 gal. caps.

Day, etc. 100-2500 lbs. Powder Mixers.

85-100-150 gal. S. S. Jacketed and Mixing Kettles.

Huhn Steam and Gas Fired Rotary Dryers.

Kent and Lehman, etc. 3 Roll Mills, 12" x 30" and 16" x 40" sizes.

Allis Chalmers, Great Western Sifters.

Pony MX, ML, Auto. Duplex Labelrites; World Rotary and Straightaway Labelers.

Sweetland, Vallez, Shriver Filters.

Pneumatic Scale Cartoning Line.

Miller, Scandia, Hayssen Wrappers.

Package Machinery Co. FA, FA2, FA2Q, FA4Q Wrappers.

THIS IS ONLY A PARTIAL LIST — OVER 5000 MACHINES IN STOCK

Act Now For Choice Buys—Tell Us All Your Machinery Requirements

Union **STANDARD EQUIPMENT CO.**
318-322 LAFAYETTE ST., NEW YORK 12, N.Y.

TOP PRICES PAID FOR YOUR SURPLUS EQUIPMENT

QUICK DELIVERY ON GUARANTEED EQUIPMENT

Large Stock at our Brooklyn Warehouse & Shop

DRYERS & KILNS

2—Proctor & Schwartz 6 fan automatic Conveyor Dryers, 2 Roll 40" Chilling Units.
3—Allbright-Nell 4'x9' Atmos. Drum Dryers.
1—Buffalo Vac Drum Dryer 24x28". Also Rotary Vac. Dryer & Vac. Shelf Dryers.
10—Steam, Gas & Electric Dryers, Tray, Truck & Conveyor Types.
6—Rotary Dryers, Direct & Indirect. Also Jacketed & Steam Tubes.
New Rotary Dryers, Kilns & Coolers built to order.
1—Ruggles Coles 7½' x 80' Rotary Dryer.

CENTRIFUGAL & CENTRIFUGES

3—Tolhurst 40" Suspended Type Centrifugals, Bottom Discharge, Motor Driven.
6—Centrifugals 24", 30", 40" & 48", Steel, Copper, Stainless & Rubber Lined.
12—Sharples Centrifuges #18A Stainless. Also #6.
3—DeLaval Multiplex Clarifiers #2000, 3100 & 3201.

FILTERS

6—SPERRY 36" CORNER FEED IRON FILTER PRESSES.
10—Sperry & Shriver 12", 18", 24", 30", 36", & 42", Iron & Wood Filter Presses.
1—12" Bronze Filter Press.
Extra 36" & 48" iron plates & frames.
4—Yellow type 40 RS, 41 Stainless covered Leaf Rotating Filters.
Sweetland & Oliver Rotary Vac. Filters.

KETTLES & TANKS

Davies 1000 gal. closed jack agit. steel kettle.
8—Jacketed Kettles 50 to 1000 gals.
1—Struthers-Wells 10 gal. jack. agit. Autoclave 3 HP motor.
1—250 gal. Lead Lined Kettle.
25—New Stainless Steel Tanks 50 to 5000 gals.
15—Stainless, Alum., Copper, Glass & Lead Lined Kettles & Tanks.
Impregnating Units, Lab. or Pilot Plant & Up.
6—Copper Varnish Kettles 100, 200 & 300 gals.

PULVERIZERS & MILLS

1—#00 Raymond Mill 30 HP., complete.
4—#0000 Raymond Mills.
9—Hammer Mills & Pulverizers 3 to 50 H.P.
1—Schutz-O'Neill 20" Pulverizer. Also #1.
1—Sturtevant 30" Rock Emery Mill.
1—Robinson 22" Attrition Mill.
1—Double Roll Crusher 10" dia. x 14" face.
1—Lehman 4 Roll W. C. 12" x 30" Steel Mill.
5—Lehman & Kent 3 Roll Steel Mills, 9" x 22", 9" x 32", 12" x 30" & 16" x 40".
1—9" x 36" Double Steel Roller Mill.
1—9" x 24" 3 pr. high steel Roller Mill.
3—Hoochin 10" x 20", 4 Roll Granite Stone Mills.
3—Abbe Pebble Mills 6' x 6', 5' x 5½' & 2' x 2½'.
6—Abbe Jar Mills Lab to 15 gal. sizes.
Abbe #0 Rotary Cutter 3 HP. motor.
Leominster #0 Rotary Cutter, 1 HP. motor.
Mikro Pulver, Fitzpatrick Comminute Mills, etc.

MIXERS—ALL TYPES

Baker-Perkins heavy duty double arm Jack. Mixers. 200 & 9 gals.
Horiz. Mixers single & double arm to 200 gal.
6—Pony or Paste Mixers, 8, 15 & 30 gals.
1—Conery 2 HP. 4 speed Vert. Mixer.
6—Lead & Paste Mixers 50 to 150 gals.
4—Simpson Intensive Mixers #9 to 3-½.
1—Nauta Drum Type Blender 1000#.
10—Dry Spiral Mixers 50 to 2500#.
12—Portable Elec. Liquid Mixers ¼ to 3 HP.

SCREENS & SIFTERS

2—Tyler #38 Jr. Hummer Screens, 20"x30".
1—Rotex Sifter 20"x54", 4 Surfaces.
2—Gyratory suspended Sifters 20" & 24".

MISC. & SPECIALS

1—Std. Autom. Sumon Jr. Vac. Filler.
4—French Oil Linseed & Cottonseed Hydr. Presses.
6—French Oil Motor Driven Expellers.
New 9" x 12" Lab Mixing Mills & Calenders.
4—Farrel 10" x 36", 18" x 48", 10" x 48" & up to 22" x 60" 2 Roll Mixing Mills.
3—Rubber & Plastic Extruders 1½" to 6".
2—Stokes 2E Paste Fillers up to 5 gal.
1—Marco #200 Stainless Steel Homogenizer.
1—Stokes & Smith & Day Powder Fillers.
6—Filling Machines, Liquid, Paste & Powder.
1—Rotary & Single Punch Tablet Machines.
2—Revolving Pans 30" & 36".
10—Stokes, Vert. High Vac. Pumps.
2—Howe Mogul Barrel Bag Packers.
2—Worthington 12" x 12" x 12" Vac. Pumps.
6—Devine & Buffalo Vac. Pumps.
Hosokawa 5000# Sonic Crusher & Smaller sizes.
Soap Machinery for Toilet Laundry Chip Liquid.
Hydr. Presses, Pumps & Accumulators for Rubber & Plastics, Injection Molding Machines, Conveyors & Elevators, Boilers.

WE BUY YOUR SURPLUS MACHINERY & COMPLETE PLANTS
PARTIAL LISTING. WRITE FOR BULLETINS. PHONE: WORTH 2-5745

STEIN EQUIPMENT COMPANY

90 West Street, New York 6, N. Y. Cable: Mechequip

PEBBLE MILLS — 30"x20", 36"x42", 48"x60", 54"x48".
FILTER PRESSES—18" W/40 P&F, 24" W/51 P&F, 36" W/60 PL, 42" W/25 P&F.
CRUSHERS JAW—6x9, 12x20, 18x10, 14x26, 24x36.
HAMMER MILL—Wms 20 & 30 NF. Jeffrey 36x24.
RING ROLLER MILL — Sturtevant #1, Bradley Hercules Jr.
SKIDS—1000 Wood Top W/steel reinforced legs, 36"x54" and 60".
DUST COLLECTOR—Dracco 4-Compartment. Perfecto-AA. 1080 sq. ft.
MILLS — HARDINGE — 5'x22", 7'x48", 8'x22", 10'x48", W/motor drives.
PUMPS—Centrifugal, New Stock.
EXHAUSTERS—Amer. 50's, W/Motors.
AIR COMPRESSORS—New and Rebuilt.

LAWLER COMPANY

Durham Avenue Metuchen, N. J.
Metuchen 6-0245

BOILERS

10 to 1000 H. P.

NEW-USED RECONDITIONED

Steam, Gas and Electric Power Equipment

J. PARKER THOMPSON CO., INC.
507 FIFTH AVE., NEW YORK CITY
MURRAY HILL 7-0547-8-9

$1500 PRIZE CONTEST

Contest starts with the month of November 1951 and ends October 1952 inclusive. (12 months).

Statements will be judged on the basis of sincerity, originality and aptness of thought.

SUBJECT:

"My Happiest Experience With Used Equipment"

Some men know how much they have been helped by used equipment; others do not. This contest is sponsored by the First Machinery Corp. to spread that knowledge as a service to Industry. Your experiences in buying, using or selling equipment to be adapted for another purpose will demonstrate its value.

In this time of emergency, the First Machinery Corp. wants every plant operator to realize that good existing used equipment can be utilized to stretch scarce materials, to eliminate months of delay, to furnish immediate production facilities. That is the prime purpose of this contest.

The RULES!

Write a statement on the subject "My Happiest Experience With Used Equipment". It is not required that the equipment shall have been purchased from FMC.

Entries are limited to one a month for each contestant.

Entries become the property of The First Machinery Corp. with permission to publish, none returned. Winners will be notified by mail as well as publication in this periodical.

This contest is subject to Federal, State and Postal regulations.

Contest open to any person connected with the Chemical and allied industries except employees of the First Machinery Corp., their Advertising Agency and their families.

The JUDGES!

DR. WALTER J. MURPHY,
Editor of American Chem. Society Publications

MR. T. R. OLIVE,
Editorial Staff of McGraw-Hill Publications

MR. FRED R. FIRSTENBERG,
President of the First Machinery Corp.

Send your Contest Entry to Contest Editor, Care of

Cash Prizes are $100. a Month for 12 Months. $300. for the Best Article of the Year.

FIRST MACHINERY CORP.

157 HUDSON ST. WOrth 4-5900 NEW YORK 13, N. Y.

GEAR UP FOR BIGGER PRODUCTION WITHOUT DELAY

GOOD USED EQUIPMENT from your First Source of Supply

FIRST MACHINERY CORP.
157 HUDSON ST.
WOrth 4-5900
NEW YORK 13, N.Y.

G.E. Turbine Generator 375 KVA complete with Switchboard and accessories.

Philadelphia 2 Speed Reduction Drives; Ratio 20.1:1; Output 87/29; H.P. 2/.67; RPM 1150/560.

Tyler-Hummer Screen No. 38.

Day Roball Sifters; 40 x 120"; single or double screens.

Sweetland No. 2 Pressure type Filters.

Industrial Tank Type Filters with 17 screens from 12" x 30" to 30" x 30".

Williams Ring Roll Mill, ring 10" x 3" having three rolls 4" x 3" complete with cyclone, dust collector, and vacuum separator.

Raymond IMP Mills with grind chambers 9" x 18" and 10" x 30".

Raymond No. "00" Automatic Pulverizer.

Robinson Double Runner 26" Attrition Mill with two 10 H.P. motors.

French Oil Mill Curb Press, 24" x 36" with two posts 10" sq. 450 ton pressure complete with hydraulic press.

Pebble Mills from 18" x 24" to 60" x 72"; some with motors, pebbles, etc.

Manton Gaulin Nickel Homogenizer Type 400 with 20 HP motor.

Premier Liquid Type Colloid Mill, Model L 15 with 30 HP motor.

Premier Paste Type U3 Colloid Mill; Stainless with 30 HP motor.

Sharples Stainless Steel Super Centrifuge Misco type; 3 HP.

Eird Young Rotary Vacuum Filters; 4' x 4'; 4' x 2'.

Struthers Wells Stainless Steel Heat Exchanger; 1,000 sq. ft.

Louisville Counter Current Monel Lined Dryer, 38" x 16' long.

FIRST MACHINERY CORP.
157 Hudson Street,
New York 13, N. Y.

DRYER or KILN: 10' x 90' heavy duty, plate thickness 22.95 lbs. per sq. ft., offered with or without furnace, dust collector, Clarage #541 Exhauster, motors and auxiliary equipment. NEW condition. Also, Dryer 90" x 60 ft. with auxiliary equipment. NEW condition. 1—Kiln 72" x 44 ft. with 48" x 46 ft. Cooler. NEW condition.

COAL CRUSHER: Jeffrey Flextooth 24" x 42", with Allis Chalmers type ARZ, 75 H.P. motor, 3 phase, 60 cy. to 2300 volt, 24 hrs., 55 deg., 1170 RPM, with 3 groove V belt pulley.

REDUCTION CRUSHER: Symons 2 ft. Cone.

PULVERIZER: Hardinge Conical Ball Mill 10 ft. x 30" with 300 H.P. motor and all auxiliary equipment for dry grinding. Also, Hardinge, 5 ft. x 22" Ball Mill with 30 H.P. motor.

COMPRESSOR: Worthington 2 stage 29/18½ x 21, type DC2, 600 H.P. synchronous motor, 3 phase, 60 cycle, 440 volt, 180 RPM, Cap. 3000 CFM, 100 lbs. pressure, complete with auxiliary equipment. In operation now, available immediately. 1—Worthington 15—9½ x 12", cap. 700 CFM @ 100 lbs., direct connected to 440 volt, 125 H.P. synchronous motor, with all auxiliary equipment.

DIESEL MOTOR: 122 H.P. Caterpillar D13000 complete with clutch, V-belt pulley and spare parts.

BOOT BUCKET ELEVATORS: 2—63 ft. 6" manganese steel chain, buckets 16" wide.

SCREW CONVEYOR: 12" x 22 ft. with center bearing, 87 RPM, capacity 30 TPH.

DRAG SCRAPERS, CRESCENT BUCKETS: 1—Sauerman 2 yd. Drag Scraper outfit complete, without 75 H.P. motor. 1—Sauerman ¾ yd. capacity complete with diesel motor. 1—Sauerman 1 yd. capacity complete with diesel motor. 1—Sauerman 100 H.P., minus hoist.

PIPE: 6000 ft. New 1", Grade 1, Johnsonite Plastic Pipe, in 400 ft. coils. 1000 ft., 1—½", Grade 2, in 30 ft. lengths.

A. J. O'NEILL
Lansdowne, Pa.
Phila. Phones: Madison 3-8300—3-8301

FOR SALE

Filter Presses: 24" C.I. plate and frame.
Reactors: 250 gal. stainless steel.
Dryer: atmos. double drum Sheller.
Centrifugal: Fletcher 12" port. stain. steel.
Mixer: W&P, 2 gal. jacketed.
Autoclave: 10 gal. Bellevak, cast iron.
Vacuum Pan: 6" Harris stainless steel.
Mixer: Struthers-Wells 4x8" jack., closed.
Powder Mixers: 100 to 2500 lb. capacities.
Pebble Mills: 200 gal. Patterson buhrstone lined.
Screens: Rotex, Rehall—var. sizes.
Colloid Mills: Premier, Charlotte, Eppenbach.
Oil Purifier: De Laval No. 60K.
Filters: Sparkler models 12-S, 14-M-S, et. al.
Dough Mixers: Single and double arm.
Vacuum Pump: Nash Hytor model H-3.

WE BUY—WE SELL—WE LIST

LOEB EQUIPMENT SUPPLY CO.
1927 W. North Ave. Chicago 22, Ill.

FOR SALE

Spencer Turbine Blower, multi-stage, 110 C.F.M., 10 oz., 2½" intake, 4" discb. Directly connected to G.E., 1 HP, D.C., 115 V., comp. wd., 3500 RPM motor (used).

Leland Motors, explosion proof, 1/3 HP, AC/90/1/115/1725 repulsion induction (used).

U. S. Grinder, 1 H.P., 230 V., D.C., 1800 RPM with guards (used).

Dirtervent Exhauster, paddle, steel housing, 330 C.F.M., 7.6 S.P., 6½" intake, 5½" discb, direct connected to Diehl, totally enclosed motor, 2 H.P., 3 phase, 60 cyc., 3400 RPM (new).

Gast Vacuum Pumps, 3½ cu. ft. at 15" vac., belt driven—1/3 HP capacitor, 110 v., 60 Cyc., A.C. motor (new).

American Blower Co. Squirrel Cage Blower, 42" Wheel, belt drive. Cap. to 37,000 CFM (used)

Air Compressors and Electric Motors.

ELECTRIC TRADING CO.
Dept. CE 313 Canal St., N.Y.C.

For Sale For Sale

1—Baker-Perkins 150 Gal. Stainless Steel Mixer, double-arm, sigma blades, with 40 hp explosion-proof motor.
1—Baker-Perkins 100 Gal. Stainless Steel Mixer, double-arm, sigma blades, with 20 hp explosion-proof motor.
1—J. H. Day #2, 75 Gal. Brighton Mixer.
5—Pebble Mills 40 to 500 Gal.
10—Pony Mixers 0, 15 and 40 Gal.
1—Read Lab Stainless Steel Motor Drives Dough Mixer, double-arm, sigma blades.
HIGH SPEED Roller Mills 9"x36" to 18"x48".
1—Motor Driven Belt Conveyor.
3—3" Premier Colloid Mills, watercooled.

SPECIALIZING IN REBUILT MACHINERY

Irving Barcan Company
249 ORIENT AVE.
JERSEY CITY 5, N. J.
Phone—Ofllevare 2-6495-6

SMALL SLIGHTLY USED

Powder Sifter

Available for immediate shipment. Orville Simpson Rotex #11. Single screen, 6 square feet sifting area, and includes two extra screen frames. Although two years old, we used this sifter only a few hours per month, and it is like new in every way. $350.00.

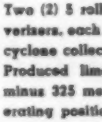
WINTON ENGINEERING CO.
2935 Jessamine St. Cincinnati, Ohio

RAYMOND MILLS
FOR SALE

Two (2) 5 roll Raymond High Side Pulverizers, each with separator, exhauster, cyclone collector, connecting piping, etc. Produced limestone whiting to 99.9% minus 325 mesh. Must remove from operating position within next 30 days.

FS-1896, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

MOTORS, GENERATORS, TRANSFORMERS



1—1500 H.P.
Bought and Sold
New and Rebuilt

ELECTRIC EQUIPMENT CO.
ROCHESTER 1, N. Y.

FOR SALE
2 ALLIS CHALMERS
INTERPLANE GRINDERS

Complete with 100 H.P. 2300 Volt 60 Cycle 3 Phase 3550 RPM Motor and Starter. One unit Brand New, Other Slightly Used.

Suitable for Grinding All Sorts of Dry Material Such as Wood, Bark, Wood Flour, Dry Agricultural Products, etc.

WOOD CONVERSION CO.
CLOQUET, MINNESOTA
Purchasing Department

NO WAITING★★WE'RE READY!! *ARE YOU?*

2—Tanks, s/s clad, 2000 gallons, 2 HP turbine agitators 160 RPM
1—Eimco 3' x 2' s/s type 316 continuous filter, with variable speed drive
1—Stokes 625 gal s/s vac pan or still jacketed
1—Shriver NEW 36" 4 eye closed washing filter press, 24 chambers
13—Filter Presses and skeletons, 7" to 36" wood and cast iron
1—Hardinge 4' x 14'6" tube mill with 40 HP motor
10—Lead lined tanks, 400 to 3350 gals, rectangular and cylindrical
1—Buehler 5 roll mill, 12" x 32" water cooled
3—J. H. Day 3 roll mills, 16" x 40", water cooled
23—Tablet Presses, Colton & Stokes, ¼" up to 2" single punch and rotary
1—Worthington 210 ton refrigeration unit, 428 HP, complete
1—Dorr unused rake classifier, rubber lined, 40' overall length
1—Patterson 6' x 4' pebble mill, silex lined
1—Abbe #6 jacketed ball mill, 40" x 39"
1—Louisville 4'6" x 25' tubular dryer, complete
75—Pumps; centrifugal, rotary, vacuum; ½" up to 6"
1—40" Heresite coated centrifugal, link suspended
1—18" rubber covered basket centrifugal with 2 HP motor
2—30" x 30" s/s drums dryers, 1" face
1000' Pyrex 2" pipe, U's and T's
1—350 gallon Theo. Walters nickel still, jacketed with alum. condenser and column
1—Kelly 100 gallon lead lined jacketed reactor, 200 psi
8—100 gallon type 374 reactors or nitrators, some jacketed, with Nettco agitator drives
3—Devine vacuum pumps, 12" x 12" and 4" x 6"
2—Standard Knapp #429 carton gluers and sealers, with compression belts
9—Dry powder mixers, 50# up to 1300# Day and Robinson
1—Fitzpatrick s/s Model D comminuting machine, 5 HP
1—Mikro 2SP pulverizer, 10 HP
9—Hammermills, and Pulverizers, Williams, Gruendler, Allis-Chalmers, Buffalo

The Above just a small fraction of our inventory—Send for Bulletin 1151

What have you for Sale?—We Buy or Trade

CHEMICAL & PROCESS MACHINERY CORP.

146 Grand Street • WOrth 4-8130 • New York 13, N. Y.

NEW and GOOD-AS-NEW EQUIPMENT

Stainless Steel Tanks, new, 100 and 200 gal., dished bottoms with stands.
1—Stainless Tank No. 430, Chrome, vert. 7' dia., 10' deep, dished bottom, ⅜ plate.
20—Steam Jacketed Kettles, Stainless Steel Copper & Aluminum, 5 to 250 gals.
1—Copper Evaporator, steam jacketed, 9'1" x 3'3".
60—New Pressure Cookers, 18" x 18" & 24" x 28".
30—Pumps, steam and electric.
1—New Glass Nash Centrifugal Pump, 150 gpm at 40'.
1—Sutkovak Impregnating Tank, 42" x 52", steam jacketed, used one week.
1—Ribbon type Mixer, steam jacketed.
1—Steel Tank, 67,500 gals.
3—New Drum Rollers.
1—150 gal. Jacketed Glass-Lined Tank with agitator.
1—Sweetland Filter, No. 5, 15 leaves.
1—Sperry Filter, 18 x 18, 24 plate.
2—Plate & Frame Filters, 22", open del.
4—Tanks, 100,000 gals. each.
1—300 gal. Steam Jacketed Double Arm Mixer.
6—Stokes Rotary Tablet Machines RD4.
10—New Sharples Oil Purifiers.
6—New Cleveo Can Filling Machines.

SPECIAL: 8—Stainless Steel Steam Jacketed Filters with Stainless Steel Screens—used one month—like new.
1—Albright-Nell Chill Roll or Drum Dryer 4' x 8'.

H. LOEB & SON :-: 4643 LANCASTER AVE. PHILADELPHIA 31, PA.

AIR COMPRESSORS VACUUM PUMPS

Rebuilt By American Since 1902

Your Choice	Your Model
American	Stationary
Bury	Horizontal
Chicago Pneu	Vertical
Curtis	Electric
Devny	Steam
Gardner Denver	Portable
Le Roi	Gasoline
Pennsylvania	Diesel
Schramm	Pneu Tired
Sullivan	Skids
Worthington	

—for Sale • for Rent—

Over 200 In Stock

AMERICAN AIR COMPRESSOR CORP.
NORTH BERGEN NEW JERSEY

Mixer, ribbon type, 10'6" x 30" x 36" deep, double spiral, stay-bolted jacket for high pressure, with motor and reducer.
Mixer, J. H. Day, Double Sigma Blade—Size 6 Water Jacket—Tilt Type with Motor
Reaction Kettle—30" dia. x 29" deep—S/S with G. E. Strip heaters, insulated, cooling coil in kettle, agitator and covers, thermometers & recorder.
Tanks—S/S and Steel—All sizes to 5000 Gal.
Kettles—S/S 40 Gallon to 100 Gallon—In Stock—New and Used.

AARON EQUIPMENT COMPANY
1347 So. Ashland Ave., Chicago 8, Illinois
PHONE: CHesapeake 3-5300

ROTARY DRYERS

XB-10—70" x 45' Indirect, Heat Russias-Calso (Direct Heat: 4' x 30', 4' x 45', 4½' x 40', 5' x 50', 6 x 35, 6'6" x 60', 7' x 50', 8' x 70' & 10' x 80'.

MISCELLANEOUS EQUIPMENT

18" Three Stage Wetherill Type Magnetic Separator
Dings 60"—3 Roll Type L.E.
30", 8', 10' & 16' Mechanical Air Separators
6' x 22' Hardinge Ball Mill, Screw feed
5' x 4' Eimco Ball Mill
#0 & #1 Raymond Automatic Pulverizer
4 x 65, 6 x 60, 9 x 120 & 9 x 170 Rotary Kilns
3—5' x 22' Silex Lined Tube Mills
4—11'6 x 14' Oliver Continuous Filters
2—8' x 4' Dorrco Continuous Filters
24x18A Jeffrey Hammer Mill
#1 & 1¼ Stutevant Ring Roll Mill
Hercules Junior 3 Roll Pulverizer
Clyde-Kanata Continuous Hydrator
7 Elec. Air Compressors, 1300, 3100 & 5278 Ft.
125—8000 & 10,000 Gal. Tank Cars
45 Ton Plymouth Diesel Locomotive
2450 pt Chgo Pneu. Elec. Compressor

STANHOPE, 60 E. 42nd St., N. Y. 17, N. Y.

FOR SALE — CHEMICAL EQUIPMENT

1—3000 cu. ft. Inbert Gas Burner.
2—#6 Nash Hytor Compressors.
1—#4 Nash Hytor Compressor.
1—#5 Austin Gyratory Crusher.
3—Kennedy Ball Mills, type M Air Swept.
1250" Ingersoll Rand Air Compressor.

FS-3036, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

FOR SALE
1—Premier Type
U-3 COLLOID MILL
has had little use, in excellent condition.
THE MIAMI VALLEY COATED PAPER CO.
FRANKLIN, OHIO

Shells for Rotary Kilns or Dryers

100 FT.-9'0" DIA. 9/16" PLATE
(Girth gears & tires available)
45 FT.-7'0" DIA. ½" PLATE
90 FT.-6'0" DIA. ½" PLATE

Sections 8' to 25' long suitable for repairs or for re-assembling. All Joints separated for accurate re-joining.

DARIEN CORP., 49 E. 41st St., N. Y. 17, N. Y.

anti-corrosive

strapping and seals

A. J. Gerrard Metals and Finishes enable you to meet the corrosive conditions to which pipe lines and tanks are subjected.

MONEL
STAINLESS —TYPES 304, 316
GALVANIZED STEEL
COPPER
ALUMINUM
BRASS

Also Tools for Applying.

FREE

Handy calculator—one side tells you which strap to use for any given corrosive condition; the other side determines length and weight of strap required for any binding operation.

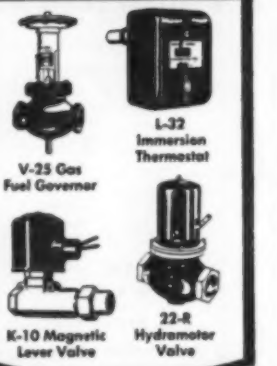
A. J. Gerrard & Co.

1934 Hawthorne Ct., Melrose Park, Ill.
(Chicago Suburb)

SM-4

AUTOMATIC CONTROL

for product or process



GENERAL CONTROLS

Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls

FACTORY BRANCHES: Baltimore 5, Birmingham 3, Boston 16, Buffalo 3, Chicago 5, Cincinnati 2, Cleveland 15, Dallas 2, Denver 4, Detroit 21, Glendale 1, Houston 6, Indianapolis 4, Kansas City 2, Minneapolis 2, Newark 6, New York 17, Philadelphia 23, Pittsburgh 22, St. Louis 3, San Francisco 7, Seattle 1, Tulsa 6, Washington 6.
DISTRIBUTORS IN PRINCIPAL CITIES

ADVERTISERS INDEX

Acme Coppersmithing & Machine Co. 187
Air Preheater Corp. 38
Albert Pipe Supply Co. ..B292
Aldrich Pump Co., The 54
AllMetal Screw Pdts. Co. ..340
Allis Chalmers Mfg. 19, 56, 71
Alloy Steel Products 15
Aluminum Co. of America 46, 122
American Blower Corp. 52
American Car & Foundry ..420
American Cyanamid Co. 78-79
American Flange & Mfg. Inc. 119
American Gas Assoc. 58
American Hard Rubber Co. 181
American Locomotive Co. ..279
American Metal Hose 358
American Optical Co. 6
American Platinum Works R426
American Tool & Machine Co. 316
Ampco Metal Inc. 256-261
Ansul Chemical Co. ..193, 267
Anti-Corrosive Metal Pdts. Co., Inc. 319
Anthracite Equipment Corp. L425
Armstrong Cork Co. 62
Arrow-Hart & Hegeman Elec. Co. 284
Atlas Mineral Products Co. LB268
Atlas Powder Co. 256
Autoclave Engineers Inc. B278
Automatic Sprinkler Co. of Amer. 194

Babcock & Wilcox Co. 40-41
Babcock & Wilcox Tube Co. 117
E. B. Badger & Sons Co. 127
Bailey Meter Co. 301
Baird Associates Inc. 218
Baker & Co. Inc. 66
Baker Perkins Inc. 116
Barco Mfg. Co. 360
Barnstead Still & Sterilizer Co. 318
Barrett Div., Allied Chemical & Dye Corp. 365
Bell & Gossett Co. 195
Bemis Brothers Bag Co. 291
Bersworth Chemical Co. 300
Bethlehem Steel Co. 361
Bird Machine Co. 9
Birmingham Committee of 100 243
Black, Sivalls & Bryson Inc. 281
Blaw Knox Const. Co. T421
Boston Woven Hose & Rubber Co. 72
Bridgeport Brass Co. 410
Bristol Company 289
Brookfield Engrg. Labs. Inc. RB268
Brown & Root Inc. 217
Buell Engrg. Co. 341
Buffalo Forge Co. 64
Buffalo Meter Co. R424
Buflovak Equpt. Div. Blaw-Knox 355
Burgess-Manning 36

Cambridge Wire Cloth Co. L415
Camco Products Inc. R417
Carbide & Carbon Chemical Co., Div. Union Carbide & Carbon Corp. 201
The Carborundum Co. 44-45
Carpenter Steel Co. 50
Carrier Corp. 342
Cash Co., A. W. 207
Catawissa Valve & Fittings Co. 205
Celanese Corp. of America 125
Century Electric Co. 124
Chain Belt Co. 27
Chapman Valve Mfg. Co. ...376
Chemical Construction 336
Chemical Industries Exposition 24-25
Chem. Steel Const. Co. 429
Chicago Bridge & Iron Co. .402
Chicago Eye Shield Co. ...T295
Chicago Metal Hose Corp. 405

(Continued on p. 444)

DOUBLE BARREL Advertising

Advertising men agree—to do a complete advertising job you need the double effect of both Display Advertising and Direct Mail.

Display Advertising keeps your name before the public and builds prestige.

Direct Mail supplements your Display Advertising. It pin-points your message right to the executive you want to reach—the person who buys or influences the purchases.

More and more companies are constantly increasing their use of Direct Mail because it does a job that no other form of advertising will do.

McGraw-Hill has a special Direct Mail Service that permits the use of McGraw-Hill lists for mailings. Our names give complete coverage in all the industries served by McGraw-Hill publications—gives your message the undivided personal attention of the top-notch executives in the industrial firms. They put you in direct touch with the men who make policy decisions..

In view of present day difficulties in maintaining your own mailing lists, our efficient personalized service is particularly important in securing the comprehensive market coverage you need and want.

Ask for more detailed information today. You'll be surprised at the low over-all cost and the tested effectiveness of these hand-picked selections.

Dept. A

McGRAW-HILL PUBLISHING CO., INC.
330 West 42nd Street
NEW YORK 18, N. Y.

PROFESSIONAL SERVICES 428

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT
Positions Vacant 430, 431
Selling Opportunities Offered 430
Positions Wanted 430
Selling Opportunities Wanted..... 430
Employment Services 430

SPECIAL SERVICES
Contract Work 430

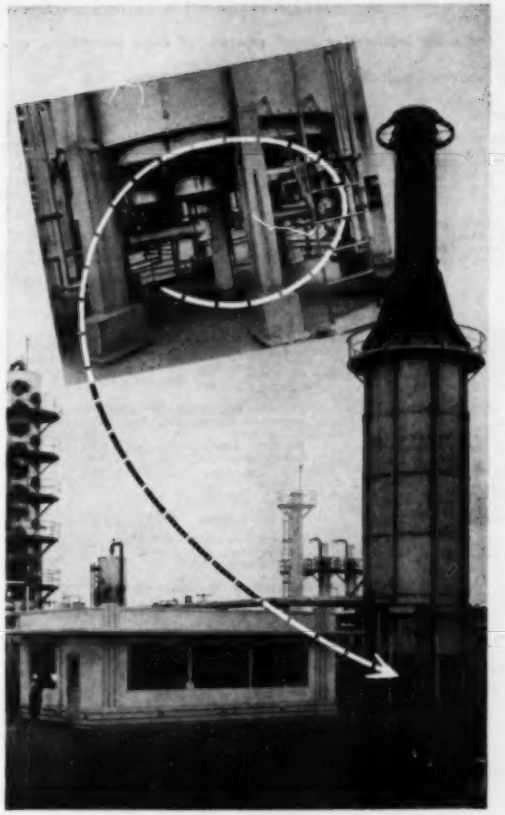
BUSINESS OPPORTUNITIES
Offered 430, 432
For Sale 432
Wanted 432

EQUIPMENT
(Used or Surplus New)
For Sale 429, 432-441

WANTED
Equipment 432
Miscellaneous 431

ADVERTISERS INDEX

Aaron Equipment Co. 441
American Air Compressor Corp..... 441
Barcan Co., Irving 440
Bauer, L. W. 432
Brill Equipment Co. 437
Carbide & Carbon Chemicals Co..... 431
Chemical & Process Machinery Corp.... 441
Chemical Service Corp..... 432
Consolidated Products Co. Inc.....429, 433
Darien Corp. 441
Deloro Smelting & Refining Co., Ltd.... 432
Drake Personnel, Inc. 430
Electric Equipment Co. 440
Electric Trading Co. 440
Equipment Clearing House, Inc..... 436
Ferguson Co., Inc., The H. K..... 431
First Machinery Corp.....439, 440
First United Broadcasters..... 430
Gale, C. J. 432
Gelb & Sons, Inc., R..... 435
Heat & Power Co., Inc..... 434
Holland, Arthur A. 432
Kehoe Machinery Corp..... 434
Kinslow Power & Equipment, Inc..... 432
Lawler Co. 438
Loeb Equipment Supply Co. 440
Loeb & Son, H. 441
Lubrizol Corporation, The 432
Luria Steel & Trading Corp., Erman-Howell Div. 434
Machinery & Equipment Corp. (N. Y. C.) 436
Miami Valley Coated Paper Co..... 441
O'Neill, A. J. 444
Opell Metal Associates 432
Owens-Illinois Glass Co..... 431
Perry Equipment Corp. 436
Stanhope 441
Stanhope, L. M. 434
Stein Equipment Co. 438
Thompson Co., Inc., J. Parker..... 438
Truland Chemical & Engineering Co..... 432
Trumbull Industrial Service Inc..... 432
Union Standard Equipment Co..... 438
Winton Engineering Co..... 440
Wood Conversion Co. 440
Worth Machinery Co. 434



EQUIPPED WITH...

NATIONAL AIROIL
Tandem Combustion Units

A large Petro-Chem petroleum heater, in a modern Texas refinery, equipped with National Airoil combination gas and oil Tandem Block Combustion Units, for firing upward. This installation is one of many throughout the U. S. and other countries so equipped with our exclusive Tandem Units.

Latest literature gladly sent upon request on your business letterhead.

CHEMICAL - PETROLEUM DIVISION

NATIONAL AIROIL BURNER CO., INC.

Main office & Factory: 1235 EAST SEDGLEY AVENUE
PHILADELPHIA 34, PA.
SOUTHWESTERN DIVISION: 2512 SOUTH BOULEVARD
HOUSTON 6, TEXAS

ADVERTISERS IN THIS ISSUE (Continued from p. 442)

For more information about products of these advertisers, use Reader Service postcard in section following

Chicago Pneumatic Tool Co. 369
Cleaver-Brooks Co. 81
Cleveland Worm & Gear Co. 109
Columbia-Southern Chemical Corp. 105
Combustion Engrg. Superheaters, Inc. 32-33
Coppus Engineering Corp. 271
Corning Glass Works....R415
Crane Co. 213
Crouse-Hinds Co. 378
Crucible Steel of America 22
Cuno Engrg. Corp. 293
Cyclotherm Steam Generators 227

Dampney Co., The.....L413
Darco Dept. Atlas Powder Co. 191
Darnell Corp. Ltd. R414
Davison Chemical Corp., The 359
The J. H. Day Co...398, L411
Day Co., The 214
DeLaval Separator 364
DeLaval Steam Turbine Co. 385
DeZurik Shower Co....LB421
Diamond Alkali Co. 61
Dodge Mfg. Corp. 242
Dorr Co. 302-303
Dow Chemical Co. 94, 94-95, 315
Dracco Corp. L417
E. F. Drew & Co., Inc.... 51
DuPont de Nemours.....363
Duraloy Co. 312
Durametallic Corp. B346
Duriron Co. Inc. 265

The Eagle-Picher Co....88-89
Eastern Industries Inc...T346
Elliott Co. 92-93
Enjay Co. Inc. 12

Fairbanks-Morse Co....98-101
Farrell Birmingham Co. Inc. 402
Fenwal Inc. 419
Ferguson, H. K. Co.....R412
Filtration Engineers Inc...374
Fletcher Works.....RB241
Flexitallic Gasket Co.....212
Floridin Co. 310
Fluid Systems Inc.....28-29
Foote Bros. Gear & Machine Corp. 23
Foster Engrg. Co. 219
Foster Wheeler Corp.....126
Foxboro Co., The.....74-75
Friez Inst. Div. of Bendix Aviation Corp. T292
Fuller Co. 368

General Amer. Transp. Corp. 179, 216, 313
Gen. Chem. Div. Allied Chem. & Dye Corp.....111
General Controls LB442
General Electric Co. 16-17, 47, 96-97, 272
General Ind. Development Corp. R418
General Radio Co. 65
Gerrard & Co. RB442
Glitsch, Fritz W. 309
Globe Steel Tubes Co. 87
The B. F. Goodrich Co.... 13
Goodyear Tire & Rubber... 15
Goulds Pumps Inc. 308
Graver Tank & Mfg. Co. Inc. 77
Graver Water Conditioning Co. 326
Greer Hydraulics Inc.....297
Grinnell Co., Inc. 68

Hagan Corp. 57
Hammond Bag & Paper T268
Hardinge Co., The.....206
H. M. Harper Co. B347
Harrisburg Steel Corp.....320
Heil Process Equip. Co....429
Heineken, W. P. 429
Helicoid Gage Div., Amer. Chain & Cable Co. 344
Henszey Co. T347
Hills McCanna Co. L416
Homestead Valve Mfg. Co. 384
Hooker Electrochemical Co. 400
Hough Co., Frank 407

Illinois Elec. Porcelain Co. 311
Illinois Water Treatment Co. 302
Ingersoll-Rand 337
Insul-Mastic Corp. 269
International Engrg. Inc...132
International Nickel Co. Inc. 8

Jackson & Church Co.....331
Jefferson Chem Co., Inc...372
Jeliff Mfg. B348
Jenkins Bros. 273
Johns-Manville 199
Joy Mfg. Co. 404

Kaiser Aluminum & Chemicals Inc. 261
Kalamazoo Tank & Silo Co. 295
Keasbey & Mattison Co.... 39
Kemp Mfg. Co., C. H. 226
Kentile Inc. 271
Kidde & Co., Walter.....200
Kinney Mfg. Co. 307
Maurice A. Knight.....306
Kold-Hold Mfg. Co. 266
Koppers Co. Inc. Precipitator Dpt. 118
Koppers Co. Inc. 288
Koven & Bros. Inc., L. O....394

LaBour Co. 133
Ladish Co. 33
Lapp Insulator Co. 37
Lawrence Mach. & Pump Corp. R411
Layne Bowler Co. 304
Leeds & Northrup Co.....357
Link-Belt Co....11, 42, 53, 86
Liquid Carbonic Corp.....298
Liquidometer Corp.....T294
Louisville Dryer Div. of Ken. Amer. Trans. Corp.179
Lukens Steel Co. 10

Mahon Co. R. C. 60
Manning Maxwell & Moore Inc. 90
Marconi Inst. Ltd. T348
Marley Co. Inc., The..... 7
Master Elec. Co....3rd Cover
McGraw-Hill Book Co...R413, L424
Mechanical Equip. Co. Inc.289
McQuay Inc. 254
Mears-Kane-Ofeidt Inc...T426
Merrick Scale Mfg. Co....429
Metalsmiths Div. of Orange Roller Bearing Co. Inc..429
Michigan Pipe Co. 334
Michigan Wheel Co....RB416
Midwest Piping & Supply Co. 249
Mine Smelter Supply Co...B328
Minneapolis-Honeywell Regulator Co., Industrial Div. 82-83, 221, 366-367
Mixing Equipment Co. Inc.183
Monarch Mfg. Works Inc.L241
Monsanto Chemical Co.106-107
Mundet Cork Corp. L418
D. J. Murray Mfg. Co. 26

Nash Engrg. Co. 30
Natl. Airoil Burner Co....R443
National Aluminate Corp..128
National Box & Lumber Co.392
Natl. Carbon Div., Union Carbide & Carbon Corp.262
Natl. Engrg. Co. 329
Natl. Filter Media Co.....370
Natl. Lead Co. 370
Naugatuck Chemicals Div. of U.S. Rubber Co.....376
Neville Co. 252
Newark Wire Cloth Co...286
New England Tank & Tower Co. L390
Niagara Alkali Co. 387
Nichols Engrg. & Research Corp. T427
Nicholson & Co., W. H....241
Nordstrom Valve Div., Rockwell Mfg. Co...114-115

Ohio Steel Foundry Co....235
Oldbury Electro-Chem. Co.B294
Omega Machine Co.....RT416
Oronite Chemical Co.....260
Owens-Illinois Glass Co...380

Pabco Products Inc. 192
Pangborn Corp. 188-189
Patterson-Fdry & Mach. Co 4th Cover
Patterson Kelley Co. 373
Penberthy Injector Co....382
Pennsylvania Ind. Chemical Corp. 120
Perkin-Elmer Corp. 325
Permutit Co. 355
Pfaudler Co. 175
Pfizer & Co, Inc., Chas....338
Philadelphia Gear Works Inc. 286
Phila. Quartz Co. B326
Pittsburgh Corning Corp..379
Pittsburgh Letrodryer Corp. 349
Pittsburgh Lectromelt Corp.391
Potter Aeronautical Co....276
Posey Iron Works, Inc.... 43
Powell Co., Wm. 253, 396
Powers Regulator Co. 247
Prater Pulverizer Co. T331
Pritchard & Co., J. F. 377
Process Equip. Div. of Gen. Amer. Transp. Corp. 313
Pulverizing Machinery Co. 91

Quaker Oats Co. R409

Raybestos-Manhattan Inc.239
Raymond Pulverizer Div., Combustion Engrg. Co...214
Read Standard Corp. 234
Republic Steel Corp. 59
Research Corp. L422
Revere Copper & Brass Inc.342
Reynolds Metals Co. 333
Rietz Co. RD426
Rohm & Haas Co. 259
Roosevelt Oil & Refining Corp. 408
Roots-Connersville Blower Corp. 258
Ross Heater & Mfg. Co....322
Ryerson & Son Inc., J. T...134

Safety Car Heating Lighting Co., Inc. 242
Saran Lined Pipe Co. 315
Sarco Co., Inc. 274
Sauereisen Cements Co....429
Schmieg Industries Inc...B327
Schneible Co., Claude B...T278
Schutte & Koerting Co....383
Sieberling Latex Prods. Co. B248
Simpson Mix Muller Div., Natl. Engrg. Co. 229
Sier-Bath Gear & Pump Co. T226
Sivyer Steel Casting Co...121
SKF Industries, Inc. 406
W. W. Sly Mfg. Co. L423
Solvay Sales Div., Allied Chem. & Dye Corp. 232
Sparkler Mfg. Co. 287
Spray Engrg. Co. T320
Sprout Waldron & Co. 85
Standard Oil Co. Indiana.. 67
Standard Steel Corp. 390
Stanley Co. Inc., Wm. W.M222
Stephens Adamson Mfg. Co. 76
Sterling Elec. Motors.....112
Stokes Machine Co., F. J..393
Struthers Wells Corp. 351
Sturtevant Mill Co. 401
Submerged Combustion Co. B324
Sun Shipbuilding & Dry Dock Co. 388
Superior Combustion Ind. Inc. RB421
Swartwout Co. 185
Swenson Evaporator Co...4-5
Syntron Co. T324

Taber Pump Co. B250
Tagliabue Instruments Div. Weston Elec. Instrument Corp. 354
Taylor Forge & Pipe Works 81
Taylor Instrument Co.....321
Texas Gulf Sulphur Co. Inc.399
Toledo Scale Co. L414
Trane Co. The.....317
Traylor Engrg. & Mfg. Co. 63
Tri-Clover Machine Co....248
Tube Turns Inc.. ...2nd Cover

Uehling Instrument Co..B223
Union Carbide & Carbon Corp., Carbide & Carbon Chem. Co. 201, 262
Union Iron Works.....T248
Universal Road Machy. Co. RT422
U. S. Industrial Chemicals Inc. 69-70
U. S. Rubber Co. 84
U. S. Steel 231
U. S. Stoneware Co. 102

Viking Pump Co. T223
Vitro Corp. LB426

Wallace & Tiernan Co. Inc. L409
Walworth Co. 329
Warren Steam Pump Co. Inc. 299
Water Cooling Equipment Co. 251
Watson Machine Co.....T328
Watson Stillman.....121
Welding Fittings Corp.....395
Westinghouse Elec. Corp.20-21, 48-49, 257
Westinghouse Electric Corp. Nurtevant Div. 50
Weston Electrical Inst. Corp. Tagliabue Inst. Div. 354
Wheeler Mfg. Co., C. H.. 397
Whitlock Mfg. Co. L412
Whiton Machine Co. R423
Wiegand Gas Holder Div. of Gen. Amer. Transp. Corp.216
Wigton-Abbott Corp. 277
Wilfley & Sons Inc., A. R. 113
Williams & Co. C. K. 264
Williams Patent Crusher & Pulverizer Co. 227
Winslow Scale Co. 228
Wolverine Tube Div. of Calumet & Copper Co...129
Worthington Pump & Machy. Corp. 73, 130, 205 335, 345, 352
Wyandotte Chem. Corp.55, 253
Wyssmont Co. T327

Yale & Towne Mfg. Co....225
Yarnell-Waring Co...14, T250

FOR CLASSIFIED INDEX SEE PAGE 443

Chemical Engineering Reader Service

HOW IT WORKS

Mail the postcard below. Before mailing, circle page numbers of items about which you want more details. Then write your name and address on other side of card and mail to us. Your requests will be forwarded to companies concerned, the answer coming direct to you.

TO MAKE IT HANDY

Products and literature in this issue are listed on these pages. There are two indexes. (1) editorial items on new equipment, new products, new literature; (2) products advertised. The index of advertisers is on the proceeding page.

NUMBERS EXPLAINED

Advertisements:—There is a page number on the postcard for each advertisement. Before the number, may appear, L, R, T, B (left, right, top, bottom) locating the ad on the page; small letters following (a, b, c) indicate additional products in the advertisement.

Editorial Items:—Numerals are page numbers; the ABC's distinguish among items where more than one is on a page. There is a number on the postcard for each item in three editorial departments: Equipment News, New Products, and New Literature.

EDITORIAL ITEMS

For more data, circle item number on postcard.

NEW EQUIPMENT

	Page
Acidproof Joint	184C
Air Cleaner & Dryer	192B
Aluminum Casting Alloy	184B
Arctangent Graph Paper	180C
Canned Bearings	189D
Canvas Sandals	186E
Centrifugal Pumps	190B
Ceramic-Coated Steel	184D
Column Packing	178B
Combination Burner	182A
Condensate Return Unit	182H
Continuous Drying Tunnel	177B
Conveyor Belt Cleaner	189B
Conveyor Chain	188A
Copying Machine	194A
Demineralizing Unit	178A
Electric Pallet Truck	189F
Electric Trucks	189C
Field Manometer	180A
Filter Fabrics	176A
Fire Extinguisher	186D
Flow Diverter	182E
Flowmeter Tube	180B
Forced Draft Fan	191B
Frame Ducts	184A
Gas Mask Canister	186F
Hollow Screw Heater	182G
Incandescent Lamp	194B
Infrared Analyzer	180D
Insulating Cement	182B
Insulating Cement	182C
Keg Pallet	189A
Lacquer Heater	182B
Lithographed Drums	188B
Metallizing Unit	194D
Multi-Stage Pumps	190C
Network Analyzer	178E
Overhead Chain Conveyor	186H
pH Meter	178D
Plastic Coated Gloves	186B
Portable Oven	182F
Reciprocating Pumps	191A
Reclosing Relay	178C
Remote Dynamometer	180F
Remote Speed Control	194E
Safety Goggle Pliers	186C
Safety Signs	186A
Sludge Pump	190A
Sonic Meter	180E
Speed Control	194C
Stainless Steel Drum	186G
Unit Coolers	182G
Vacuum Flash Evaporator	177A
Vapor-Cooled Transformer	193A
Vertical Turbine	192A

USE THIS HANDY POSTCARD

Circle desired item, fill in reverse side, tear out and mail

READER SERVICE POSTCARD

Advertisements

1	29–29a	55	83–83	98–101b	118	130e	195	226f	232a	BL268a	288	297	316	336	357	381	394a	410	419
4–4a	29–29b	56	84	98–101c	119	130f	196	227	233b	BL268b	289	298	317	337	358a	383a	394b	L411	420
4–4b	31	57	85	98–101d	120	130g	200	228	262c	BL268c	290	299a	318	338	358b	382b	395	R411	T421
4–4c	34	58	88	98–101e	121	130h	201	229	262d	BL268d	291	299b	319	340a	339	383c	396	L412a	BL421
6	35	59	87	98–101f	122	131	202	231	253a	BL268	T292a	299c	320	340b	359	383d	397a	L412b	BB421
7	37	60	88–93a	98–101g	123	132a	203	232a	253b	269	T292b	299d	321	341	361	382a	397b	L412c	B422
9	38	61	88–93b	98–101h	124a	132b	L204	233b	253c	270	T292c	300	322	343	362	383	398	L412d	TR422
10	39	62	88–93c	98–101i	124b	132c	R205	234	253d	271	T292d	301	323	345a	363	384a	399	L412e	L423
11	40–41	63	88–93d	98–101j	124c	132d	L206	235	253e	272	T292e	302a	T324	345b	364a	384b	400a	L412f	R423
12	42	64a	90a	98–101k	124d	132e	207a	237	254	273a	T292f	302b	B324	T346	364b	384c	400b	L412g	424
13	43	64b	90b	98–101l	124e	132f	207b	239	257	273b	T292g	302c	325	B346	365	385a	400c	L412h	L426
14	44–45	65	90c	98–101m	124f	134	207c	241	L258	273c	B292	302d	T326	T347	366–7	385b	400d	L412i	R426a
15a	46	66	90d	102	124g	175	212	242	259	273d	293	305a	B326	B347	368	385c	400e	L412j	R426b
15b	47a	67	91	105	124h	179	213	243	260a	274a	T294	305b	T327	T348	369	385d	400f	R412	R426c
16–17	47b	68	92–93a	106–107a	124i	181	214	244	260b	274b	B294a	306	B327	B348	370	385e	400g	L413	LB426
18	47c	69–70	92–93b	106–107b	124j	183	216	245a	260c	274c	T294b	307	T328	349	371	385f	401	L414	T426
19	47d	71	92–93c	106–107c	124k	185	217	245b	261	276	T295a	308	B328a	351	372	385g	402	R414	427
20–21	48–49	72	92–93d	106–107d	124l	186	218	245c	262a	277	T295b	309	B328b	352a	373	386	403	L415	443
22	50a	73	92–93e	109	125	188a	219	245d	262b	T278	T295c	310a	B328c	352b	374	387	404	R415	445a
23a	50b	74–75	92–93f	111a	126	188b	221	245e	264	B278	T295d	310b	329	352c	375	389	405	L416	445b
23b	50c	76	92–93g	111b	127	188c	T223	247	265a	279	T295e	311a	T330	B352d	376	390	406a	TR416	445c
23c	51	77	92–93h	112	128	188d	M223	TL248	265b	280–1	T295f	311b	T331	353	377	391	406b	BR416	445d
23d	52a	78–79a	92–93i	113	129	189	B223	BL248	265c	282	T295g	311c	B331	354a	378	392	407	L417	445e
23e	52b	78–79b	94–95	114	130a	191	225	249	265d	284	T295h	312	333	354b	379	393a	408	R417	446a
25–25	52c	78–79c	96–97a	115	130b	192	226a	TL250	266	285	T295i	313	334	355	380a	393b	R409	L418	446b
26	53	80	96–97b	116	130c	193	226b	BL250	267	286	T295j	314	335	356	380b	393c	L409	R418	446c
27	54	81	98–101a	117	130d	194	226c	B251	T268	287	B295	315							

Editorial Items

176A	178D	180E	182E	183C	186E	189A	190A	192B	194E	198A	200B	204E	204K	205A	205F	205K	205Q	206E	206J
177A	178E	180F	182F	184D	186F	189D	190B	193A	196A	198B	202A	204F	204L	205B	205G	205L	206A	206F	206K
177B	180A	182A	182G	186A	186G	189C	190C	194A	196B	198C	204A	204G	204M	205C	205H	205M	206B	206G	206L
178A	180B	182B	182H	186B	186H	189D	191A	194B	197A	198D	204B	204H	204N	205D	205I	205N	206C	206H	206M
178B	180C	182C	184A	186C	188A	189E	191B	194C	197B	198E	204C	204J	204P	205E	205J	206P	206D	206I	206P
178C	180D	182D	184B	186D	188B	189F	192A	194D	197C	200A	204D	204J							

Card Expires January 15

	Page
Column Packing	178B
Combination Burner	182A
Condensate Return Unit	182H
Continuous Drying Tunnel	177B
Conveyor Belt Cleaner	189B
Conveyor Chain	188A
Copying Machine	194A
Demineralizing Unit	178A
Electric Pallet Truck	189F
Electric Trucks	189C
Field Manometer	180A
Filter Fabrics	176A
Fire Extinguisher	186D
Flow Diverter	182E
Flowmeter Tube	180B
Forced Draft Fan	191B
Frame Ducts	184A
Gas Mask Canister	186F
Hollow Screw Heater	182G
Incandescent Lamp	194B
Infrared Analyzer	180D
Insulating Cement	182B
Insulating Cement	182C
Keg Pallet	189A
Lacquer Heater	182B
Lithographed Drums	188B
Metallizing Unit	194D
Multi-Stage Pumps	190C
Network Analyzer	178E
Overhead Chain Conveyor	186H
pH Meter	178D
Plastic Coated Gloves	186B
Portable Oven	182F
Reciprocating Pumps	191A
Reclosing Relay	178C
Remote Dynamometer	180F
Remote Speed Control	194E
Safety Goggle Pliers	186C
Safety Signs	186A
Sludge Pump	190A
Sonic Meter	180E
Speed Control	194C
Stainless Steel Drum	186G
Unit Coolers	182G
Vacuum Flash Evaporator	177A
Vapor-Cooled Transformer	193A
Vertical Turbine	192A

Page

NEW PRODUCTS

Adhesive 198A
Antioxidant 196B
Copper 3-Phenylsalicylate 197B
Foam Core 198C
Lead Pigment 197A
Neoprene Latex 196A
Paint Stabilizers 198B
Phosphate Coating 197C
Plasticizer 198D
Resin Coating 200B
Rubber Latices 202A
Teflon Dispersions 198E
Vinyl Plastic Coverall 200A

NEW TECHNICAL LITERATURE

Analysis 205K
Anhydrides 206A
Blowers & Compressors 204C
Blow-off Valves 205I
Bucket Carriers 205H
Cast Irons 205M
Electrical Accessories 205N
Fastenings 204M
Fork Trucks 206J
Gas Analysis 205K
Gas Analysis 205B
Glass Block 206C
Heat Exchangers 204I
Instruments 206I
Instruments 206M
Ion Exchange 204D
Ion Exchange 204E
Ion Exchange 204F
Lift Trucks 205F
Materials Handling 205L
Materials Handling 206H
Materials Handling 206K
Mixers 206E
Motors 205E
Motors 206C
Motors 205J
Motor Starters 204L
Packaging 204N
Packaging 205G
Paints 206P
Pipe Joints 206G
Piping 204H
Pressure Transmitters 204G
Process Equipment 204P
Pump 204B
Pumps 206F
Reagents 206D
Refractories 204J
Seamless Tubing 205C
Silica Cements 206B
Soybean Products 205A
Steam Traps 205D
Tachometer Indicators 205D

Page

Tubing 205P
Valves 204A
Waxes 205Q

PRODUCTS ADVERTISED

For more data, circle item number on postcard.

Page

Absorbers, falling film 126
Agitators
Complete line 290
Side entering 132f
Top entering 132e
Turbine, heavy duty, catalog B-36 183
Air conditioning & refrigeration equipment, blowers and exhauster 371
Air preheater 38
Autoclaves, high pressure, bulletin 1051 ..... B278
Bags, multi-wall T268
Bearings
Ball 406A
Roller 406b
Triple-sealed, self-aligning 282
Belting, conveyor, wire mesh L415
Belts, grommet V 13
Blast cleaning
Cabinets 188a
Machines 188b
Bends L412b
Blenders
Dry 132a
Dry, twin shell 373
Dustless 401
Blowers, turbo 337
Boilers
Package T426
Steam 31
Boxer, carboy 392
Bubble trays, light-weight 309
Burners
Gas, direct fired B324
Sulphur 187
Calenders, bulletin #174 402
Caps, welding, pressure resisting 2
Casters & wheels R414

Page

Castings
Stainless steel 285
Steel 121
Centrifugals 116, 316
Centrifugals
Built together 98-101a
Horizontally split-case 98-101c
Motor driven, suspended & open top BR241
Side-suction 98-101b
Chains, roller, steel 11
Chemical industries exposition 24-25
Chemical plant, design, engineering, construction 377
Chemical processes, acid recovery, vacuum process 370
Chemicals
Activated bauxite 310b
Activated carbon 191, 201
Agricultural 111b
Alkalies 105
Alumina 122
Aniline 94-95
Anion exchange resin, Bulletin 57 128
Anti-scorch agent, retarder PD 78-79a
Bicarbonate of soda 61
Carbonate of potash 385c
Carbon dioxide 298
Caustic potash 385b
Caustic soda 55, 233b, 385e, 400d
Citric acid 338
Crystal urea 363
Detergents, surface active 260b
Diethyl malonate 34
Fatty acids, distilled and fractionated 51
Fullers earth 310a
Furfuryl alcohol R409
Grain protectant, pyrenone 69-70
Industrial 111a
Ion exchange resins 259
Iron oxide pigments, custom made 264
Liquid chlorine 385a
Methyl chloride, bulletin 1002 193
Monyl phenol 372
Muriatic acid 400e
Oils 252b
Ortho-ethylnitrobenzene 106-107c
Ortho-phenylphenol, bulletin P-104 (HB40) P-140(AE-1) 106-107a
Oxygenated solvents and chemicals 12
Paradichlorobenzene 385d, 400g
Phosphorus & phosphorus compounds B294a
Phthalic anhydride 365

Fairbanks-Morse Co. 98-101
Farrell Birmingham Co. Inc. 402
Fenwal Inc. 419
Ferguson, H. K. Co. R412
Filtration Engineers Inc. 374
Fletcher Works RB241
Flexitallic Gasket Co. 212
Floridin Co. 310
Fluid Systems Inc. 28-29
Foote Bros. Gear & Machine Corp. 23
Foster Engrg. Co. 219
Foster Wheeler Corp. 126
Foxboro Co., The 74-75
Fries Inst. Div. of Bendix Aviation Corp. T292
Fuller Co. 368

General Amer. Transp. Corp. 179, 216, 313
Gen. Chem. Div. Allied Chem. & Dye Corp. 111
General Controls LB442
General Electric Co. 16-17, 47, 96-97, 272
General Ind. Development Corp. R418
General Radio Co. 65
Gerrard & Co. RB442
Glitsch, Fritz W. 309
Globe Steel Tubes Co. 87
The B. F. Goodrich Co. 13
Goodyear Tire & Rubber 18
Goulds Pumps Inc. 308
Graver Tank & Mfg. Co. Inc. 77
Graver Water Conditioning Co. 326
Greer Hydraulics Inc. 287
Grinnell Co., Inc. 68

Hagan Corp. 57
Hammond Bag & Paper T268
Hardinge Co., The 206
H. M. Harper Co. B347
Harrisburg Steel Corp. 330

LaBour Co. 122
Ladish Co. 25
Lapp Insulator Co. 37
Lawrence Mach. & Pump Corp. R411
Layne Bowler Co. 204
Leeds & Northrup Co. 357
Link-Belt Co. 11, 42, 53, 86
Liquid Carbonic Corp. 298
Liquidometer Corp. T294
Louisville Dryer Div. of Gen. Amer. Trans. Corp. 179
Lukens Steel Co. 10

Mahon Co. R. C. 60
Manning Maxwell & Moore Inc. 90
Marconi Inst. Ltd. T348
Marley Co. Inc., The 7
Master Elec. Co. ..... 3rd Cover
McGraw-Hill Book Co. R413
..... L424
Mechanical Equip. Co. Inc. 389
McQuay Inc. 254
Mears-Kane-Ofeidt Inc. T426
Merrick Scale Mfg. Co. 429
Metalsmiths Div. of Orange Roller Bearing Co. Inc. 429
Michigan Pipe Co. 334
Michigan Wheel Co. RB416
Midwest Piping & Supply Co. 249
Mine Smelter Supply Co. B328
Minneapolis-Honeywell Regulator Co., Industrial Div. 82-83, 221
..... 366-367
Mixing Equipment Co. Inc. 183
Monarch Mfg. Works Inc. L241
Monsanto Chemical Co. 106-107
Mundet Cork Corp. L418
D. J. Murray Mfg. Co. 26

Nash Engrg. Co. 30
Natl. Airoil Burner Co. R443
National Aluminate Corp. 128
National Box & Lumber Co. 392

Process Equip. Div. of Gen. Amer. Transp. Corp. 313
Pulverizing Machinery Co. 91

Quaker Oats Co. R409

Raybestos-Manhattan Inc. 239
Raymond Pulverizer Div. Combustion Engrg. Co. 214
Read Standard Corp. 224
Republic Steel Corp. 59
Research Corp. L422
Revere Copper & Brass Inc. 343
Reynolds Metals Co. 332
..... RD426
Rietz Co. L412
Rohm & Haas Co. 259
Roosevelt Oil & Refining Corp. 408
Roots-Connersville Blower Corp. 258
Ross Heater & Mfg. Co. 322
Ryerson & Son Inc., J. T. 134

Safety Car Heating Lighting Co., Inc. 242
Saran Lined Pipe Co. 315
Sarco Co., Inc. 274
Sauereisen Cements Co. 429
Schmieg Industries Inc. B327
Schneible Co., Claude B. T278
Schutte & Koerting Co. 382
Sieberling Latex Prods. Co. B248
Simpson Mix Muller Div., Natl. Engrg. Co. 229
Sier-Bath Gear & Pump Co. T326
Sivyer Steel Casting Co. 121
SKF Industries, Inc. 406
W. W. Sly Mfg. Co. L423
Solvay Sales Div., Allied Chem. & Dye Corp. 233
Sparkler Mfg. Co. 287
Spray Engrg. Co. T230

Wallace & Tiernan Co. Inc. L409
Walworth Co. 329
Warren Steam Pump Co. Inc. 299
Water Cooling Equipment Co. 251
Watson Machine Co. T328
Watson Stillman 131
Welding Fittings Corp. 395
Westinghouse Elec. Corp. 20-21
..... 48-49, 257
Westinghouse Electric Corp. Sturtevant Div. 50
Weston Electrical Inst. Corp. Tagliabue Inst. Div. 254
Wheeler Mfg. Co., C. H. 397
Whitlock Mfg. Co. L412
Whiton Machine Co. R423
Wiegins Gas Holder Div. of Gen. Amer. Transp. Corp. 216
Wigton-Abbott Corp. 277
Wilfley & Sons Inc., A. R. 113
Williams & Co. C. K. 264
Williams Patent Crusher & Pulverizer Co. 237
Winslow Scale Co. 228
Wolverine Tube Div. of Calumet & Copper Co. 129
Worthington Pump & Machy. Corp. 72, 130, 305 335
..... 345, 352
Wyandotte Chem. Corp. 85, 253
Wyomont Co. T327

Yale & Towne Mfg. Co. 225
Yarnell-Waring Co. 14, T250

FOR CLASSIFIED INDEX SEE PAGE 443

Page

Plastics, laminated 272
Potassium & potassium compounds B294b
Reactive silica 359
Resins 552a
Resorcinol, bulletin C-9-124 288
Rubber, laboratory service 106-107d
Soda ash 233a
Sodium benzoate 400f
Sodium sulfhydrate 400b
Sodium sulfide 400a
Sodium sulfonates 260c
Sodium tetrasulfide 400c
Soluble silicates B326
Solvents 125, 252c
Solvents naphtha 408
Solvents & solvent oils 120
Sorbitol 356
Specialties 552d
Sulphur 299
Surface active agents 78-79b
Tetrachloro phthalic anhydride 385g
Toluenesulfonic acid 106-107b
Trichlorethylene 385f
Versenes 300
Wetting agents, surface active 260a
Chilling machines 305b
Clad steels 10
Clarifiers, centrifugal, continuous 364b
Closures, drum, tri-sure 119
Coal handling equipment 42
Coatings, protective
Corrosion proof L413
Corrosion proof, bulletin 7-1 ..... HL268d
Insul-mastic 269
Tygon 102
Coils L412a
Coils, ripple fin 254
Columns, glass fractionation R415
Compressors
Air, heavy duty 404
Angle gas engine driven 352c
Centrifugal 305a
Motor driven, four corner, bulletin 726-C 369
Motor driven multi-stage 352d
Steam driven 352a
Steam driven high pressure circulators 352b
Condensers L412c
Condensers, two stage, porcelain 345b
Containers
Bags, multi-wall 291

Page

Bulk handling, air-tight, portable 83
Drums, aluminum 261
Control, systems, electronic 185
Controllers, automatic
Pressure 354a
Temperature 354b
Controls
Automatic, temperature & humidity 247
Electric 274c
Valve, limitorque catalog L-50 386
Conveyor-elevators 76
Conveyors
Oscillating 52
Pneumatic 368, L417
Coolers L412d
Coolers, rotary 63
Crystallizers, rubber-lined steel 4-5b
Cylinders, gas, seamless steel B330
Demineralizers 318
Detergents, industrial 353
Disintegration equipment
Crusher, jaw, laboratory B328a
Disintegrators B426
Hammermills 237
Mikro-atomizer 91
Pulverizer, laboratory B324c
Reduction crusher, Gy-roll B328b
Dryers 179
Dryers
Automatic 226d
Electrically activated 226b
Freeze 393b
Full line bulletin #508 390
Radiation cooled 226a
Rotary, bulletin 16-D-11 ..... L206
Rotary vacuum 393c
Semi-automatic 226c
Spray 427
Turbo, vertical T227
Vacuum shelf 393a
With activated aluminas 349
Dust collecting equipment, catalog A-652 60
Dust collectors L422
Dust collectors
Bulletin 909A 189
Suction 242
Unit 188c
Dust control systems L423
Dust & fume collectors B327
Dust & fume collectors, multiwash ... T278

Page

Dust filters, bulletin 491 314
Ejectors
Bulletin 5080 ..... 382e
Non-condensing, two stage, porcelain 345a
Steam jet, vacuum cooling 397a
Electric power, bulletin GE A-5600 ..... 96-97b
Elevators, moto-sifter L411
Engineering & Construction
Packaged plants 277
Plants 217, R412
SO_2 extraction plants 127
Evaporators
Channel switching system 313
Flextube thermal descaling type 279
Rubber lined 4-5a
Thermocompression 389
Fabricators
Bins, aluminum 77
Dust recovery systems 341
Hose vulcanizer 394a
Pipe to specifications B292
Process Equipment 355
Sprinkler tank, 7500 gal. 394b
Steel plate equipment 43
Tubes, high-chrome 40-41
Fans
Axiflo 50a
Centrifugal, general purpose 50c
Elbow axiflo 50b
Induced draft 52b
Industrial, type E 52a
Mechanical draft 64a
Fasteners, non-corrosive B347
Fasteners, stainless steel 340b
Fastening, stainless steel 319
Feeders
Dry materials TR416
Weigh L409
Filter aids, celite 193
Filter media M328
Filter media
Element coverings 276
Hard coal, anthrafilt L425
Replaceable cartridge, micro-klean 293
String filters, bulletin 103 374
Filters
Centrifugal 9
Horizontal plate 287
R.D.V. 4-5c
Finishing cabinets 185d

USE THIS HANDY POSTCARD

Circle desired item, fill in reverse side, tear out and mail

READER SERVICE POSTCARD

Advertisements

2	28-29a	55	82-83	98-101b	118	130e	195	229d	252a	BL268a	288	297	316	336	357	381	394a	410	418
4-5a	28-29b	56	84	98-101c	119	130f	199	237	252b	BL268b	289	298	317	337	358a	382a	394b	L411	420
4-5b	51	57	85	98-101d	120	130g	200	238	252c	BL268c	290	299a	318	338	358b	382b	394	R411	T431
4-5c	34	58	86	98-101e	121	130h	201	239	252d	BL268d	291	299b	319	340a	359	382c	396	L412a	BL431
6	35	59	87	98-101f	122	131	202	251	253a	BR268	T293a	299c	320	340b	360	382d	397a	L412b	BR431
7	37	60	88-89a	98-101g	123	132a	203	253a	253b	269	T293b	299d	321	341	361	382e	397b	L412c	B432
9	38	61	88-89b	98-101h	124a	132b	L304	253b	253c	270	T293c	300	322	343	362	383	398	L412d	TR432
10	39	62	88-89c	98-101i	124b	132c	R305	254	253d	271	T293d	301	323	343a	363	384a	399	L412e	L433
11	40-41	63	88-89d	98-101j	124c	132d	L306	255	253e	272	T293e	302a	T324	343b	364a	384b	400a	L412f	B433
12	42	64a	90a	98-101k	124d	132e	207a	257	254	273a	T293f	302b	B324	T346	364b	384c	400b	L412g	434
13	43	64b	90b	98-101l	124e	132f	207b	259	257	273b	T293g	302c	325	B346	365	385a	400c	L412h	L435
14	44-45	65	90c	98-101m	124f	134	207c	341	L338	273c	B293	302d	T326	T347	366-7	385b	400d	L412i	R435a
15a	46	66	90d	102	124g	175	213	243	259	273d	293	305a	B326	B347	368	385c	400e	L412j	R435b
15b	47b	67	91	103	124h	179	213	243	260a	274a	T294	305b	T327	T348	369	385d	400f	R412	R435c
16-17	47b	68	92-93a	106-107a	124i	181	214	244	260b	274b	B294a	306	B327	B348	370	385e	400g	L413	LR435
18	47c	69-70	92-93b	106-107b	124j	183	216	245a	260c	274c	T294b	307	T328	349	371	385f	401	L414	T436
19	47d	71	92-93c	106-107e	124k	185	217	245b	261	276	T295a	309	B328a	351	372	385g	402	R414	437
20-21	48-49	72	92-93d	106-107d	124l	186	218	245c	262a	277	T295b	309	B328b	352a	373	386	403	L415	443
22	50a	73	92-93e	109	125	188a	219	245d	262b	T278	T295c	310a	B328c	352b	374	387	404	R415	445a
23a	50b	74-75	92-93f	111a	126	188b	221	245e	264	R278	T295d	310b	329	352c	375	389	405	L416	445b
23b	50c	76	92-93g	111b	127	188c	T323	247	265a	279	T295e	311a	T330	352d	376	390	406a	TR416	445c
23c	51	77	93-93h	112	128	189d	M323	TL248	265b	280-1	T295f	311b	T331	353	377	391	406b	BR416	445d
23d	52a	78-79a	92-93i	113	129	189	B323	BL248	265c	282	T295g	311c	B331	354a	378	392	407	L417	445e
23e	52b	78-79b	94-95	114	130a	191	225	249	265d	284	T295h	312	333	354b	379	393a	408	R417	446a
25-25	52c	78-79c	96-97a	115	130b	192	226a	TL250	266	285	T295i	313	334	355	380a	393b	R409	L418	446b
26	53	80	96-97b	116	130c	193	226b	BL250	267	286	T295j	314	335	356	380b	393c	L409	R418	446c
27	54	81	98-101a	117	130d	194	226c	R251	T368	287	B295	315							

Editorial Items

176A	178D	180E	182E	183C	186E	189A	190A	192B	194E	198A	200B	204E	204K	204A	205F	206K	208E	206J
177A	178E	180F	182F	184D	186F	189B	190B	192A	196A	198B	202A	204F	204L	205B	205G	206L	206A	206F	206K
177B	180A	182A	182G	185A	186G	189C	190C	194A	196B	146C	204A	204G	204M	204C	205H	206M	206B	206G	206L
178A	180B	182B	182H	186B	186H	189D	191A	194B	197A	198D	204B	204H	204N	204D	206I	206N	206C	206H	206M
178B	180C	182C	184A	186C	188A	189E	191B	194C	197B	198E	204C	204I	204P	206E	206J	206P	206D	206I	206P
178C	180D	182D	184B	186D	188B	189F	192A	194D	197C	200A	204D	204J							

Card Expires January 15

Page

Fire extinguishers
Automatic systems 200
Fire-fog 194
Fire extinguishing equipment, dry chemical 267
Fittings & flanges, data sheet 81
Fittings
Conical 245c
Conical end catalog 848 ....245d
Controlled quality 25
Corrosion resistant 265d
Forged, bulletins (A3-50) (S-11 131
Pipe, stainless steel R417
Porcelain 311b
Recessed end, catalog 948 ....245a
Sanitary type catalog 150-B 245e
Stainless steel 340a
Welding 87, 249, 395
Welding, catalog 748 ....245b
Floors, corrosion proof, bulletin 3-1 ....BL268b
Fluid drives, gyrol 52c
Fluid handling system, Thermal electric, Heavy fuels ....28-29a, Industrial fluid 28-29b
Furnaces, lectromelt 391
Gages
Liquid level 382a
Pressure 244
Reflex catalog 25 ....382b
Tank T294
Gas, for infrared point drying ovens 58
Gasholders, bulletin WG22 216
Gaskets, spiral wound 212
Gear drives
Helical, bulletin MRB 23c
Straight line, bulletin LPB 23b
Worm, bulletin HGA 23a
Worm-helical 23d
Gearmotors, bulletin GMA 22e
Generators
Steam BR421
Steam, combustion 227
Grinding & fractionating in continuous operation T331
Heads, safety 381
Heat exchangers 322, L412e
Heat exchangers
Brazed aluminum 317
Hydro-flo catalog DM1150 195

Page

Heat shields, platecoil bulletin P61 286
Heaters L412f
Heaters, unit 26
Heating systems, electro-vapor, bulletin 2324 ....T421
Hose
Flexible, bulletin 68790 239
Flexible metal, bulletins 88-50 & CC-300 ....358a
Rubber, acid-conducting 19
Steam 72
Idlers, conveyor belt, spiral return 27
Instruments
Control system, electronic 301
Controllers, series 500 289
Electron diffraction, bulletin GEC-656 ....47b
Flow meters, bulletin 460 74-75
Humidity & temperature indicator T292a
Humidity and temperature recorder, portable T292c
Hygrothermograph T292d
Manometer, mercury 321
Meters, ring balance 57
Photometer, X-ray, bulletin GEC-412A 47a
Psychrometer
Hand aspirated T292b
Motor aspirated T292e
Pocket sling T-292f
Sling T292g
Recorders
Dewpoint, bulletin GEC-588 ....47d
Electronic duplex 82-83
Rotameters, bulletin 18-HA 393
Spectrometers
Infared 325
Mass, bulletin GEC-587 ....47c
Temperature indicators 90b
Thermometers
Dial 90c
Glass 90d
Recording 90a
Insulation
Block, heat 380b
Cellular glass 379
Cement, one-cote 88-89a
Cement, "66" 88-89d
Heat, magnesia L418
85% magnesia pipe covering 62
Magnesia precision molded 192
Mineral wool blankets 88-89b
Pipe, heat 380a
Surtemp blocks 88-89c

Page

Joints
Expansion 405
Revolving, bulletin #300 360
Laboratory equipment, platinum 66
Laboratory facilities, bulletin 07B6419B 19
Lighting equipment, high efficiency, bulletin 2565 378
Linings, corrosion proof, bulletin 4-1 ....BL268c
Lead center unit substations, bulletin GEA-3592 ....96-97a
Lubricants, service-supply center 67
Materials handling research & development 297
Materials of Construction
Aluminum bronzes, corrosion resistant 280-281
Aluminum industrial corrugated 333
Asbestos-cement sheets, corrugated 39
Cements corrosion proof, Bulletin 3-1 ....BL268a
Clad steels 10
Corrosion resistant permanite 306
Glazed tile for tanks & silos B295
Gold R425b
Impervious graphite 262a
Nickel 8
Platinum R425a
Porcelain 37
Silver R425c
Stainless steel 22
Stainless steel, No. 20 book 80
Steel, service plants 134
Meters
Flow, indicating 276, T347
Liquid 424
Liquid bulletin 948 ....B223
Moisture T348
Positive displacement, bulletin 40-B-14 ....L258
Viscosity RB268
Mills
Ball 132b, 446a
IMP, flash drying accessories 214
Rod 446c
Tube 446b
Mixers
For,
Chemicals with liquid measuring tank 130a
Composition materials, 13 cu.ft. capacity 130c
Drugs and plastics, 3000 lb. capacity 130b

Fairbanks-Morse Co. 98-101
Farrell Birmingham Co. Inc. 402
Fenwal Inc. 419
Ferguson, H. K. Co. R412
Filtration Engineers Inc. 374
Fletcher Works RB241
Flexitallic Gasket Co. 212
Floridin Co. 310
Fluid Systems Inc. 28-29
Foote Bros. Gear & Machine Corp. 23
Foster Engrg. Co. 219
Foster Wheeler Corp. 126
Foxboro Co., The 74-75
Fries Inst. Div. of Bendix Aviation Corp. T292
Fuller Co. 368

General Amer. Transp. Corp. 179, 216, 313
Gen. Chem. Div. Allied Chem. & Dye Corp. 111
General Controls LB442
General Electric Co. 16-17, 47, 96-97, 272
General Ind. Development Corp. R418
General Radio Co. 65
Gerrard & Co. RB442
Glitsch, Fritz W. 309
Globe Steel Tubes Co. 87
The B. F. Goodrich Co. 13
Goodyear Tire & Rubber 18
Goulds Pumps Inc. 308
Graver Tank & Mfg. Co. Inc. 77
Graver Water Conditioning Co. 320
Greer Hydraulics Inc. 297
Grinnell Co., Inc. 68

Hagan Corp. 57
Hammond Bag & Paper T268
Hardinge Co., The 206
H. M. Harper Co. B347
Harrisburg Steel Corp. 320
Labour Co. 122
Ladish Co. 35
Lapp Insulator Co. 37
Lawrence Mach. & Pump Corp. R411
Layne Bowler Co. 204
Leeds & Northrup Co. 357
Link-Belt Co. 11, 42, 53, 86
Liquid Carbonic Corp. 398
Liquidometer Corp. T294
Louisville Dryer Div. of Gen. Amer. Trans. Corp. 179
Lukens Steel Co. 10

Mahon Co. R. C. 60
Manning Maxwell & Moore Inc. 90
Marconi Inst. Ltd. T348
Marley Co. Inc., The 7
Master Elec. Co. ....3rd Cover
McGraw-Hill Book Co. R413, L424
Mechanical Equip. Co. Inc. 389
McQuay Inc. 254
Mears-Kane-Ofeldt Inc. T426
Merrick Scale Mfg. Co. 429
Metalsmiths Div. of Orange Roller Bearing Co. Inc. 429
Michigan Pipe Co. 324
Michigan Wheel Co. RB416
Midwest Piping & Supply Co. 249
Mine Smelter Supply Co. B328
Minneapolis-Honeywell Regulator Co., Industrial Div. 82-83, 221, 366-367
Mixing Equipment Co. Inc. 183
Monarch Mfg. Works Inc. L241
Monsanto Chemical Co. 106-107
Mundet Cork Corp. L418
D. J. Murray Mfg. Co. 26

Nash Engrg. Co. 30
Natl. Airoil Burner Co. R443
National Aluminate Corp. 128
National Box & Lumber Co. 392

Process Equip. Div. of Gen. Amer. Transp. Corp. 313
Pulverizing Machinery Co. 91

Quaker Oats Co. R409

Raybestos-Manhattan Inc. 239
Raymond Pulverizer Div., Combustion Engrg. Co. 214
Read Standard Corp. 234
Republic Steel Corp. 59
Research Corp. L422
Revere Copper & Brass Inc. 343
Reynolds Metals Co. 323
Rietz Co. RD424
Rohm & Haas Co. 259
Roosevelt Oil & Refining Corp. 408
Roots-Connersville Blower Corp. 258
Ross Heater & Mfg. Co. 322
Ryerson & Son Inc., J. T. 134

Safety Car Heating Lighting Co., Inc. 242
Saran Lined Pipe Co. 315
Sarco Co., Inc. 274
Sauereisen Cements Co. 429
Schmieg Industries Inc. B327
Schnetzle Co., Claude B. T278
Schutte & Koerting Co. 383
Sieberling Latex Prods. Co. B248
Simpson Mix Muller Div., Natl. Engrg. Co. 229
Sier-Bath Gear & Pump Co. T326
Sivyer Steel Casting Co. 121
SKF Industries, Inc. 406
W. W. Sly Mfg. Co. L423
Solvay Sales Div., Allied Chem. & Dye Corp. 223
Sparkler Mfg. Co. 287
Spray Engrg. Co. T320

Wallace & Tiernan Co. Inc. L409
Walworth Co. 329
Warren Steam Pump Co. Inc. 299
Water Cooling Equipment Co. 251
Watson Machine Co. T328
Watson Stillman 121
Welding Fittings Corp. 395
Westinghouse Elec. Corp. 20-21, 48-49, 257
Westinghouse Electric Corp. Sturtevant Div 50
Weston Electrical Inst. Corp. Tagliabue Inst. Div. 354
Wheeler Mfg. Co., C. H. 397
Whitlock Mfg. Co. L412
Whiton Machine Co. R423
Wiggins Gas Holder Div. of Gen. Amer. Transp. Corp. 216
Wigton-Abbott Corp. 277
Wilfley & Sons Inc., A. R. 113
Williams & Co. C. K. 264
Williams Patent Crusher & Pulverizer Co. 237
Winslow Scale Co. 228
Wolverine Tube Div. of Calumet & Copper Co. 129
Worthington Pump & Machy. Corp. 73, 130, 305, 325, 345, 352
Wyandotte Chem. Corp. 55, 253
Wyssmont Co. T327

Yale & Towne Mfg. Co. 225
Yarnell-Waring Co. 14, T250

FOR CLASSIFIED INDEX SEE PAGE 443

Page

Enamel grits 50 cu.ft. capacity..136d
Fertilizers 136g
Furnace charges, 200 cu.ft. capacity 136h
Soap powder, dustproof 136f
Glass batches 25 cu.ft. capacity....136e
Heavy duty 398
Intensive 361
Intensive mix-muller 229
Portable 133d
Propellers, stainless steel.....BR416
Ribbon 133c
Top entering, catalogue 600 .....T344
Vacuum 334
Mixing equipment, mixing, masticating, plasticizing & compounding.....T328
Motors
Brake 92-93c
Capacitor start induction, single phase 124i
Chemical, life-line 20-21
Direct current
Open 124j
Splash proof 124k
Drip-proof 92-93h
Electric, bulletin E100G.....98-101m
Explosion proof 124d
Explosion proof, bulletin SL-300-5 ..... 92-93b
Horizontal or vertical
Enclosed 445b
Explosion proof 445c
Fan cooled 445d
Open 445a
Splash proof 445c
Mill 92-93c
Open, drip proof 124a
Repulsion start induction.....124g
Splash proof
Type CSH 124h
Type SC 124b
Squirrel-cage,
Protected type 92-93g
Splash proof 92-93d
Totally enclosed, fan-cooled, bulletin S1-300-2A..... 92-93a
Totally enclosed, non-ventilated 92-93i
Synchronous 124l
Totally enclosed,
Fan cooled 124c
Fan cooled, bulletin 51B7225.....71
Non-ventilated 98-101l
Wound rotor
Open 124e
Protected type 92-93f
Splash proof 124f

Page

Nozzles
Scrubbing L241
Spray T230
Packings, flexible metallic, bulletin 429CE B346
Pipe
Corrosion resistant 265c
Impervious graphite 262b
Plastic uscolite 84
Porcelain 211a
Prefabricated 63
Saran rubber lined 334
Steel, saran lined 315
Piping L412g
Plant expansion in Birmingham, Alabama 243
Plant gas analyzer 218
Power drives, electric, variable speed, bulletin B-53..... 112
Power systems for chemical processing 48-49
Precipitators, electrastatic 118
Presses, pulp B331
Pressure vessels L412h
Process equipment information.....R418
Protective coatings, vinyl resins.....375
Pumps
Acid 113
Acid and chemical, vertical, bulletin 203-4 .....R411
Centrifugal 64b, 285, 299c
Centrifugal
Self-priming 123
Single section, bulletin CL-339 .....BL250
Chemical, bulletin 52B7638 56
Corrosion resistant 265a
Cycling jet, bulletin 5030.....332c
Deepwell turbine 98-101e
Direct flow 54
Horizontal and vertical angle-flow 98-101d
Reciprocating 299d
Rotary T223, 299b
Rotary, hot oil 307
Screw 299a, T226
Stainless steel, centrifugal, bulletin 725.3 308
Sump, explosion-proof, bulletin 4929 ..... 332d
Vertical turbine type L264
Reboilers L412j
Receivers L412i

Page

Recorders
Multiple point 357
Process control 366-367
Refractories 44-45
Refrigerating machine, absorption....362
Regulators, pressure steam or air.....213
Retorts, high alloy castings..... 312
Roasters, fluo solids systems..... 303
Safety equipment
Aprons T295a
Gloves, neoprene latex, slip-proof. BL248
Goggles T295b
Guards T295c
Helmets T295d
Hoods T295e
Lenses T295f
Respirators T295g
Respirators, twin cartridge..... 6
Shields T295h
Sleeves T295i
Spectacles T295j
Scales
Beam
Counting 98-101g
Full capacity 98-101f
Type registering 98-101h
Dial
Bench 98-101k
Platform 98-101j
Portable 98-101l
Printweighs L414
Tank & hopper 228
Screens, vibrating 86
Scrubbers, venturi 336
Separators
Centrifugal TR422
Centrifugal, continuous 364a
Shaker, sieve, testing, end-shak..... 236
Speed reducers, fan-cooled, catalog 300 109
Starters, motor, weatherproof, explo-safe 284
Steam traps
Impulse 14
Thermostatic, catalog 751.....TR241
Steel, stainless 231
Strainers, bulletin S-203.....TL250
Stuffing boxes, high duty..... 176
Sutures 78-79c

USE THIS HANDY POSTCARD

Circle desired item, fill in reverse side, tear out and mail

READER SERVICE POSTCARD

Advertisements

2	28-29a	55	83-83	98-101b	113	130e	196	236d	232a	BL268a	289	297	316	338	357	351	394a	419	419
4-5a	28-29b	56	84	98-101c	119	130f	199	227	252b	BL268b	289	298	317	337	358a	382a	394b	L411	420
4-5b	31	57	85	98-101d	120	130g	200	228	252c	BL268c	290	298a	318	336	358b	382b	395	R411	T421
4-5c	34	58	86	98-101e	121	130h	201	229	252d	BL268d	291	299b	319	340a	359	382c	396	L412a	BL421
6	35	59	87	98-101f	122	131	202	231	253a	BR268	T292a	299c	320	340b	360	382d	397a	L412b	BR421
7	37	60	88-93a	98-101g	123	132a	203	233a	253b	269	T292b	299d	321	341	361	382e	397b	L412c	B422
9	38	61	88-89b	98-101h	124a	132b	L204	233b	253c	270	T292c	300	322	343	362	383	398	L412d	TR422
10	39	62	88-89c	98-101i	124b	132c	R205	234	253d	271	T292d	301	323	345a	363	384a	399	L412e	L423
11	40-41	63	88-89d	98-101j	124c	132d	L206	235	253e	272	T292e	302a	T324	345b	364a	384b	400a	L412f	R423
12	42	64a	90a	98-101k	124d	132e	207a	237	254	273a	T292f	302b	B324	T346	364b	384c	400b	L412g	424
13	43	64b	90b	98-101l	124e	132f	207b	239	257	273b	T292g	302c	325	B346	365	385a	400c	L412h	L425
14	44-45	65	90c	98-101m	124f	134	207c	241	L258	273c	B292	302d	T326	T347	366-7	385b	400d	L412i	R425a
15a	46	66	90d	102	124g	175	212	242	259	273d	293	305a	B326	B347	368	385c	400e	L412j	R425b
15b	47a	67	91	105	124h	179	213	243	260a	274a	T294	305b	T327	T348	369	385d	400f	R412	R425c
16-17	47b	68	92-93a	106-107a	124i	181	214	244	260b	274b	B294a	306	B327	B348	370	385e	400g	L413	LB426
18	47c	69-70	92-93b	106-107b	124j	183	216	245a	260c	274c	T294b	307	T328	349	371	384f	401	L414	T426
19	47d	71	92-93c	106-107c	124k	185	217	245b	261	276	T295a	308	B328a	351	372	385g	402	R414	427
20-21	48-49	72	92-93d	106-107d	124l	186	218	245c	262a	277	T295b	309	B328b	352a	373	386	403	L415	443
22	50a	73	92-93e	109	125	188a	219	245d	262b	T278	T295c	310a	B328c	352b	374	387	404	R415	445a
23a	50b	74-75	92-93f	111a	126	188b	221	245e	264	B278	T295d	310b	329	352c	375	389	405	L416	445b
23b	50c	76	92-93g	111b	127	188c	T223	247	265a	279	T295e	311a	T330	352d	376	390	406a	TR416	445c
23c	51	77	92-93h	112	128	188d	M223	TL248	265b	280-1	T295f	311b	T331	353	377	391	406b	BR416	445d
23d	52a	78-79a	92-93i	113	129	189	B223	BL248	265c	282	T295g	311c	B331	354a	378	392	407	L417	445e
23e	52b	78-79b	94-95	114	130a	191	225	249	265d	284	T295h	312	333	354b	379	393a	408	R417	446a
25-25	52c	78-79c	96-97a	115	130b	192	226a	TL250	266	285	T295i	313	334	355	380a	393b	R409	L418	446b
26	53	80	96-97b	116	130c	193	226b	BL250	267	286	T295j	314	335	356	380b	393c	L409	R418	446c
27	54	81	98-101a	117	130d	194	228c	R251	T268	287	B295	315							

Editorial Items

176A	178D	180E	182E	183C	188E	189A	190A	192B	194E	198A	200D	204E	204K	205A	205F	205K	205Q	206E	206J
177A	178E	180F	182F	184D	186F	189B	190B	193A	196A	198B	202A	204F	204L	205B	205G	205L	206A	206F	206K
177B	180A	182A	182G	186A	186G	189C	190C	194A	196B	156C	204A	204G	204M	205C	205H	205M	206B	206G	206L
178A	180B	182B	182H	186B	186H	189D	191A	194B	197A	198D	204B	204H	204N	205D	205I	205N	206C	206H	206M
178B	180C	182C	194A	188C	188A	189E	191B	194C	197B	198E	204C	204I	204P	205E	205J	205P	206D	206I	206P
178C	180D	182D	184B	188D	188B	189F	192A	194D	197C	200A	204D	204J							

Card Expires January 15

Page

Temperature controls, thermostats, thermoswitch 419
Tandem combustion units 443
Tank cars, contamination proof 420
Tanks
  Horton 402
  Rubber lined 181
Towers
  Cooling R251, 397b
  Water cooling 7
Transformers, variac, bulletin 65
Traps, steam 274a
Trucks
  Dump, payloader 407
  Hand, electric drive 225
Tubes
  Condenser 129
  Condenser, copper alloy 342
  Fin 271
  Flow 219
  Heat exchanger
    Aluminum 46
    Electrunite 59
Tubing
  Carbon & alloy, seamless steel 117
  Corrosion Resistant, DuPlex 410
  Flexible metal 358b
Turbines
  Gear, package, booklet B-4346 257
  Multi-stage, bulletin GEA-5580 16-17
  Steam
    Mechanical-drive 225
    Vertical R423
Unions, full line, catalog 11 ..... R205

Page

Valves
  Back pressure 207b
  Check 273d
  Control, diaphragm type, bulletins 700-3 and 750 221
  Corrosion resistant 265b, 396
  Diaphragm L416
  Gate 273c
  Gate
    Aloyco 15a
    Bulletin list 960 376
    OS&Y 253b
    Stainless steel 253a
  Gland, standard bolted 114-115
  Globe 273b
  Globe
    Aloyco 15b
    Stainless steel 253c
  Leak-proof BL421
  Plug
    Cam-sealed, quarter turn 384a
    Lever-sealed, quarter turn 384b
    Lubricated 329
    Self-sealed, lubricated 384c
  Porcelain 311c
  Pressure reducing & regulating,
    Pilot operated 207c
    Single seat, bulletin 962 ..... 207a
  Solder-end, bulletin form 198 ..... 273a
  Swing check 253c
  Y, high vacuum 253d
Vents, air 274b
Vessels
  Mixing, bulletin #121 ..... TL248
  Pressure 361
Vibrators, electric T324
Water treatment
  Deaerating type water conditioning system, Hot-Z 73

Page

De-Ionisers
  Industrial 302a
  Mixed-bed 302c
  Portable 302b
  Portable, mixed-bed 302d
Demineralizing unit, mixed-bed 320
Ion exchange processes 387
Ion exchange process, bulletin 4081 202
Wire mesh B348

NOW AVAILABLE

Reprints of last month's Chemical Engineering Report

SUBLIMATION . . .

. . . **PRINCIPLES** of a little-known unit operation on which there has been scanty know-how—until now.

. . . **APPLICATIONS,** both organic and inorganic—from Anthracene to Uranium Hexafluoride.

. . . **EQUIPMENT,** two different types now commercially available, advantages and disadvantages.

. . . **TRENDS** toward the use of sublimation as principles and applications become better known. **10 PAGES** of engineering information—analyzing fundamental principles and indicating conditions under which a sublimation process would be successful.

ASK FOR: Reprint S. Price 25c. Send order with remittance to:

Chemical Engineering
Attention: M. Malin
330 West 42nd St.
New York 18, N. Y.

ADVERTISING STAFF

SALES MANAGER ..... Bayard E. Sawyer
BUSINESS MANAGER ..... Albert E. Weis

Sales Representatives

ATLANTA ..... R. C. Maultsby
BOSTON ..... W. D. Boyd
CHICAGO ..... L. A. Cunningham
CHICAGO ..... J. M. Rodger, Jr.
CLEVELAND ..... D. G. Sawyer
DALLAS ..... J. H. Cash
LOS ANGELES ..... J. H. Allen
LOS ANGELES ..... H. L. Keeler
NEW YORK ..... R. G. Frederick
NEW YORK ..... J. E. Tuohig
PHILADELPHIA ..... E. M. Schellenger
PITTSBURGH ..... D. A. Facka
SAN FRANCISCO ..... Ralph Dorland
SAN FRANCISCO ..... John Otterson

USE THIS HANDY READER SERVICE POST CARD

Name _____

Position _____

Company _____

Address _____

City & State _____

PLACE 3¢ STAMP HERE

CHEMICAL ENGINEERING
READER SERVICE DEPARTMENT
330 W. 42nd STREET
NEW YORK 18, N. Y.

Time and money saving ideas of how you too can take advantage of Master's unusual ability to provide the RIGHT horsepower, the RIGHT shaft speed, the RIGHT construction features, the RIGHT mounting . . . all combined into one compact power package.

Don't put up with make-shift assemblies when you too may be enjoying these advantages. Master Motors, available in thousands and thousands of types and ratings (up to 150 HP) give you a selection you can get nowhere else.

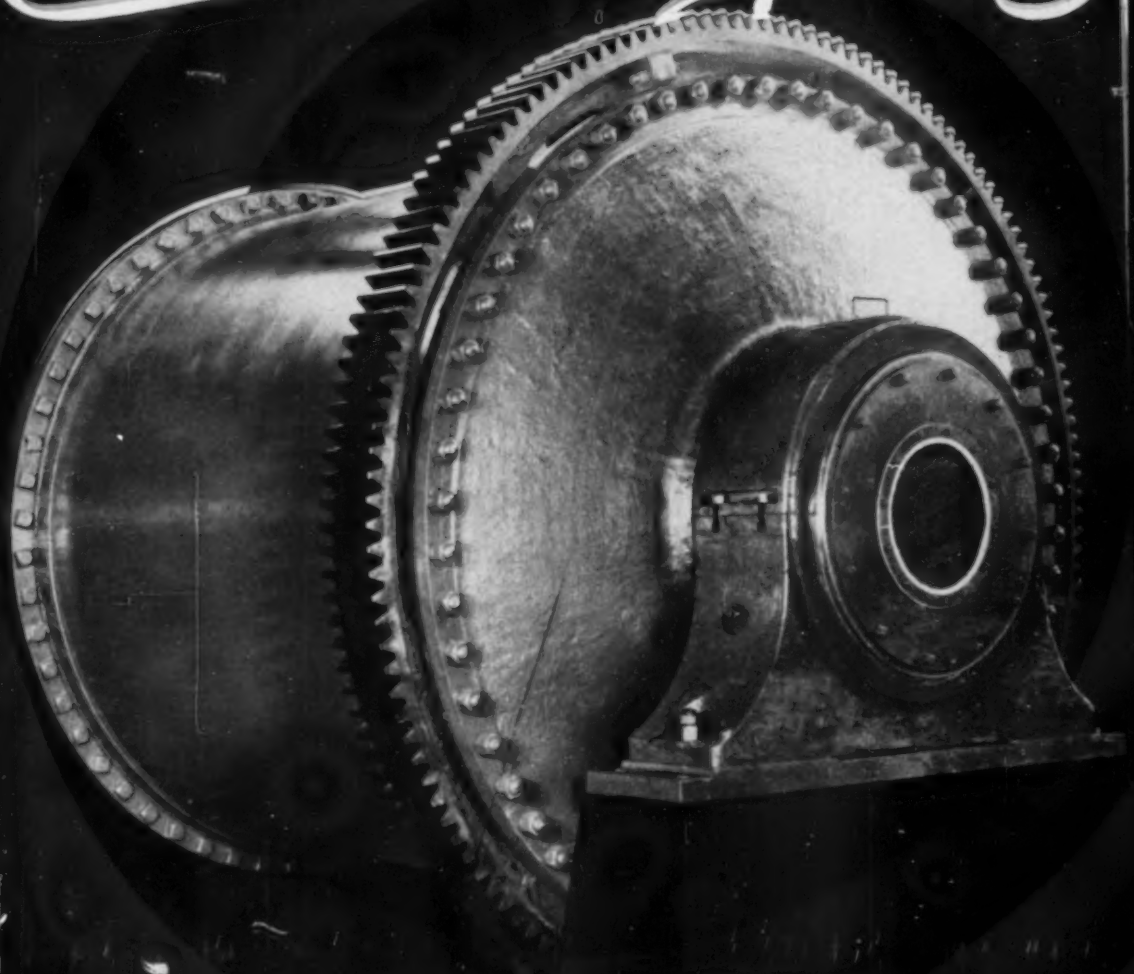
Open, enclosed, splash-proof, fan-cooled, explosion-proof . . . horizontal or vertical . . . for all phases, voltages and frequencies . . . in single speed, multi-speed and variable speed types . . . with or without flanges or other special features . . . with 5 types of gear reduction up to 432 to 1 ratio . . . with electric brakes . . . with mechanical variable speed units . . . and for every type of mounting . . . Master has them all and so can be completely impartial in helping you select the one best motor drive for YOU.

this may give you ideas

Select the RIGHT power drive from Master's broad line and you can increase the saleability of your motor driven products . . . improve the economy and productivity of your plant equipment.

THE MASTER ELECTRIC COMPANY
DAYTON 1, OHIO

Continuous Grinding



PATTERSON

BALL MILLS · TUBE MILLS · ROD MILLS